SONY

CONTROL PANEL

# BKH-2501

INSTALLATION AND MAINTENANCE MANUAL

1st Edition (Revised 3)

Serial No. 10001 and Higher

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Important — To insure that the complete system (including this peripheral) is capable of complying with the FCC requirements, it is recommended that the user make sure that the individual equipment of the complete system has a label with one of the following statements.
"This equipment has been tested with a Class A Computing Device and has been found to comply with Part 15 of FCC rules."
— or —
"This equipment complies with the requirements in Part 15 of FCC rules for a Class A Computing Device."
— or equivalent.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart J of Part 15 of FCC Rules.

**For the customers in Canada**

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

**Pour les utilisateurs au Canada**

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

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# 第1章　概要
# SECTION 1　INTRODUCTION
# SECTION 1　INTRODUCTION
# TEIL 1　EINLEITUNG

本機をリモートコントロール・パネルアダプターボックスBKH-2017A（別売り）に収納すれば，ソニー1インチビデオテープレコーダーBVH-2500を手元で操作することができるようになります。

### コントロールパネル BKH-2501

記録，再生，サーチ，プリロール点サーチ（頭出し）の各機能に加えて，高度な編集機能（20キー部を使ったAUDIO SPLIT EDIT，SPOT ERASE，VAR MEMORYなど）を備えています。さらに，テープの静止状態および低速度走行状態で記録が可能なΔt REC機能（スチル記録，ステップ記録，スロー記録）を備えているほか，指定した番地の頭出し（SEARCH TO CUE）も可能です。

本機のつまみ，スイッチ類，ボタン類の使い方など詳しいことは，BVH-2500のオペレーション・アンド・メンテナンスマニュアルをご覧ください。

L'installation de cette unité dans le boîtier d'adaptation pour panneau de télécommande BKH-2017A (en option) permet de contrôler à distance le fonctionnement du magnétoscope Sony BVH-2500 de 1 pouce.

### PANNEAU DE CONTROLE BKH-2501

En plus des fonctions fondamentales d'enregistrement et de lecture, y compris celles de recherche par bague (navette (SHUTTLE), impulsion (JOG), impulsion programmée (PROGRAM JOG), etc.), le panneau de contrôle BKH-2501 autorise des fonctions de montage perfectionnées, telles que la lecture à mémoire variable, l'effacement local et le montage sonore divisé.
En outre, cette unité permet les enregistrements Δt (enregistrement STILL et STEP possible en mode d'image fixe et enregistrement SLOW possible pendant que la bande défile au ralenti) et la fonction de recherche à repérage.

En ce qui concerne les détails sur les commandes et les réglages de cette unité, prière de consulter le mode d'emploi et d'entretien du BVH-2500.

When this unit is installed into the BKH-2017A remote control panel adaptor box (optional), you can operate the Sony BVH-2500 1-inch VTR from a remote location.

### BKH-2501 CONTROL PANEL

The BKH-2501 control panel has all the basic functions of recording and playback including search-dial functions (SHUTTLE, JOG, PROGRAM JOG, etc.), and high-grade editing funcitons, such as variable memory playback, spot erasing, and audio split editing.
In addition, Δt recordings (STILL recording and STEP recording which can be made in the still mode, and SLOW recording which can be made while the tape is running at a slow speed) and SEARCH TO CUE function are possible with this unit.

For details on the controls and switches on the unit, refer to the operation and maintenance manual of the BVH-2500.

Beim Einbau in die Fernbedienungs-Adapterbox BKH-2017A (Sonderzubehör) kann der Sony 1-Zoll Videorecorder BVH-2500 auch fernbedient werden.

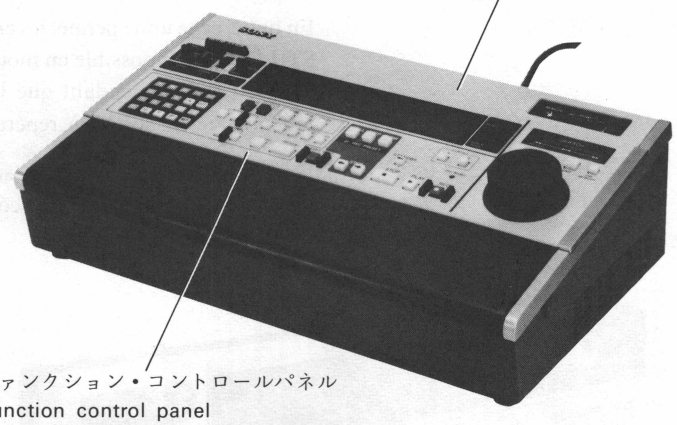
### BEDIENUNGSPULT BKH-2501

Das Bedienungspult BKH-2501 besitzt außer allen Hauptfunktionen für Aufnahme und Wiedergabe, einschließlich Suchknopf-Funktionen (SHUTTLE, JOG, PROGRAM JOG usw.) und noch eine Reihe fortschrittlicher Schnittfunktionen, beispielsweise Variier-Memory, Teil-Löschung und separater Tonschnitt.
Außerdem sind mit diesem Gerät Δt-Aufnahmen (STILL- und STEP-Aufnahme bei Standbildbetrieb, sowie SLOW-Aufnahme bei geringer Bandgeschwindigkeit) und die SEARCH TO CUE-Funktion.

Genauere Informationen zu den Reglern und Schaltern finden Sie in der Bedienungs- und Wartungsanleitung des BVH-2500.

別売りアクセサリー
**Optional accessory**
**Accessoire en option**
**Sonderzubehör**

## リモートコントロール・パネルアダプターボックスBKH-2017A
## BKH-2017A REMOTE CONTROL PANEL ADAPTOR BOX
## BOITIER D'ADAPTATION POUR PANNEAU DE TELECOMMANDE BKH-2017A
## FERNBEDIENUNGS-ADAPTERBOX BKH-2017A



リモートコントロール・パネルアダプターボックス
Remote control panel adaptor box
Boîtier d'adaptation pour panneau de télécommande
Fernbedienungs-Adapterbox

ファンクション・コントロールパネル
Function control panel
Panneau de contrôle des fonctions
Bedienungspult
BKH-2501

VTRをリモートコントロールしたいとき，ファンクション・コントロールパネルをこのボックスに収納し，手元で操作することができます。使いやすいスラントタイプで，RS-422シリアルコミュニケーション回路とその電源部を内蔵しています。
BVH-2500本体から，最大1000mまで離して操作できるようになります。

The BKH-2017A is a remote control panel adaptor box with its control panel set at an angle.
You can control the BVH-2500 from up to 1000 meters (3300 feet) away, when the function control panel is installed into the BKH-2017A.
The BKH-2017A is comprised of an RS-422 serial communication circuit and a power supply circuit.

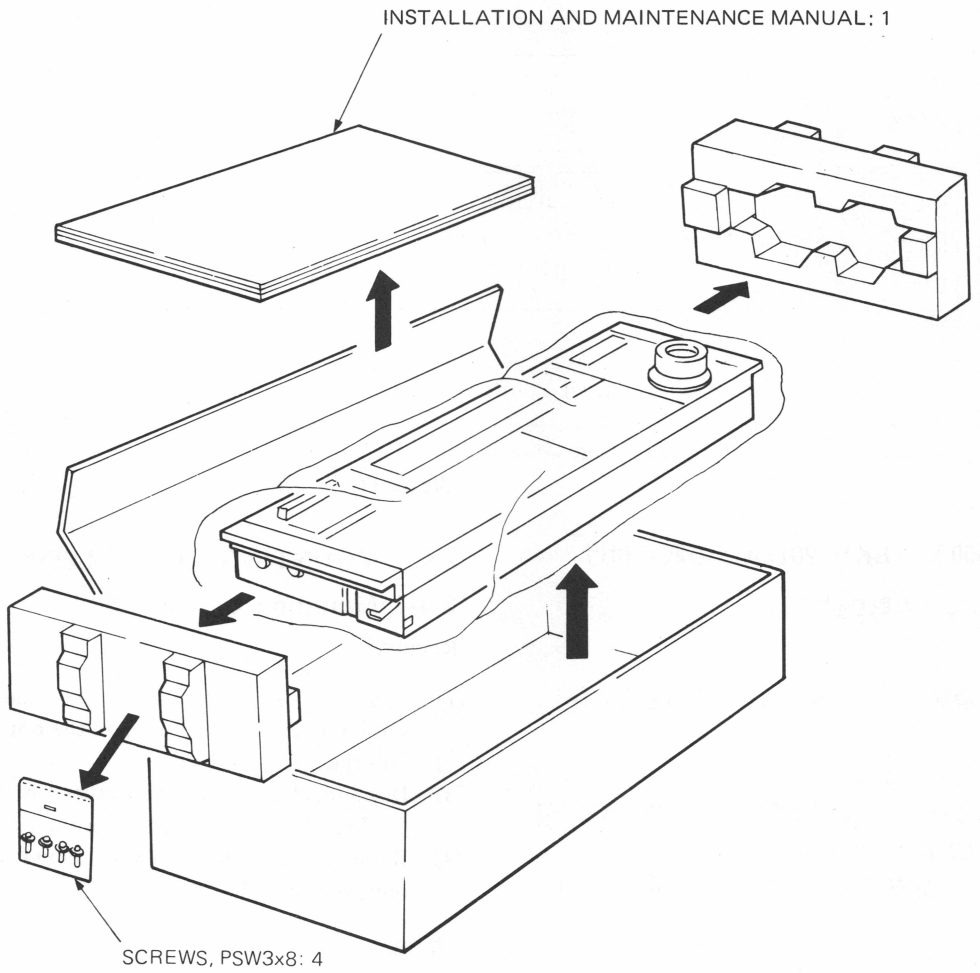
Le boîtier d'adaptation pour panneau de télécommande BKH-2017A, dont le panneau de contrôle est incliné, permet de contrôler le magnétoscope BVH-2500 jusqu'à une distance de 1000 mètres (3300 pieds) quand le panneau de contrôle des fonctions y est installé. Le BKH-2017A comprend un circuit de communication en série RS-422 et un circuit d'alimentation.

Bei der BKH-2017A handelt es sich um eine Fernbedienungs-Adapterbox, deren Bedienungspult schräg eingesetzt wird. Wird ein Bedienungspult in die BKH-2017A eingesetzt, kann der BVH-2500 bis zu einer Entfernung von max. 1000 Metern fernbedient werden.
Das Netzteil ist bereits in der BKH-2017A eingebaut. Die Übertragung der Steuersignale erfolgt seriell mit RS-422.

# 第2章　設　置
# SECTION 2. INSTALLATION

## 2-1. 開梱と再梱包

## 2-1. UNPACKING AND REPACKING




## 2-2. 標準付属品

**ねじ PSW 3×8** 4個
VTR本体への取り付け用ねじ

**INSTALLATION AND MAINTENANCE MANUAL: 1**

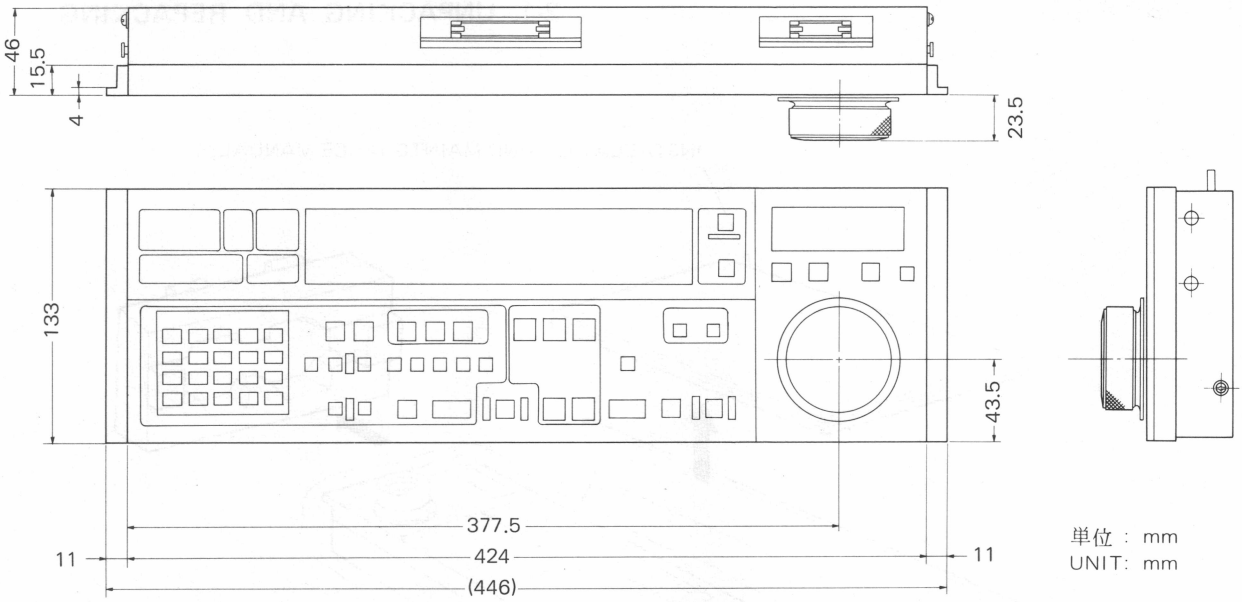
## 2-2. SUPPLIED ACCESSORIES

**SCREWS PSW3x8:** 4pcs.
One set of screws necessary for mounting the BKH to the BVH-2500

**INSTALLATION AND MAINTENANCE MANUAL: 1**

## 2-3. 外形寸法及び重量

## 2-3. DIMENSIONS AND WEIGHT




単位 : mm
UNIT: mm

**重量** 2.1kg

**WEIGHT** 2.1 kg

## 2-4. BVH-2500及びBKH-2017Aへの取り付け

### 2-4-1. BVH-2500への取り付け

**取り外し**

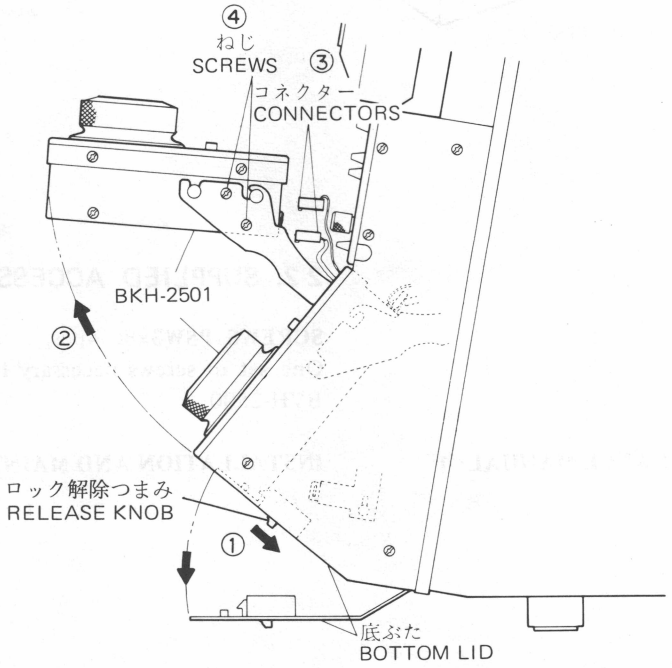
① 左右のロック解除つまみ（各1個）を矢印方向に押し，底ぶたを開く。
② BKH-2501を押し上げる。
③ BKH-2501に接続されている2個のコネクターCN701（10ピン）とCN702（26ピン）を外す。
④ ねじPSW3×8（左右各2個）を外し，BKH-2501を外す。

## 2-4. MOUNTING TO BVH-2500 & BKH-2017A

### 2-4-1. Mounting to BVH-2500

**Removal**

① Slide the release knob on each side in the direction shown by the arrow and open the bottom lid.
② Pull the BKH-2501 up.
③ Disconnect the two connectors CN701 (10 pins) and CN702 (26 pins) connected to the BKH-2501.
④ Remove the two PSW3x8 screws on each side to remove the BKH-2501.

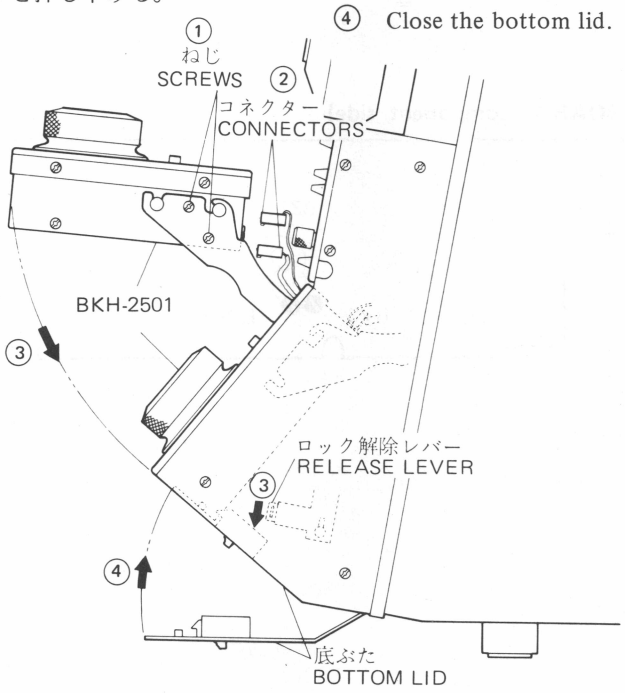


**取り付け**

① ねじ PSW3×8（左右各 2 個）を使って，VTR 本体の支持金具に取り付ける。
② 2 個のコネクター CN701（10 ピン）と CN702（26 ピン）を BKH-2501 に接続する。
BKH-2501 側のコネクターについているレバーで必ずロックすること。
③ VTR 本体の左側板内側にあるロック解除レバーを矢印方向に押しながら，BKH-2501 を押し下げる。
④ 底ぶたを閉じる。

**Mounting**

① Mount the BKH-2501 on the BVH-2500 brackets with two PSW3x8 screws on each side.
② Connect the two connectors CN701 (10 pins) and CN702 (26 pins) to the BKH-2501.
Be sure to lock them using the connector levers on the BKH-2501.
③ Push the BKH-2501 downward while pushing the release lever that is inside the left side panel of the VTR in the direction shown by the arrow.
④ Close the bottom lid.

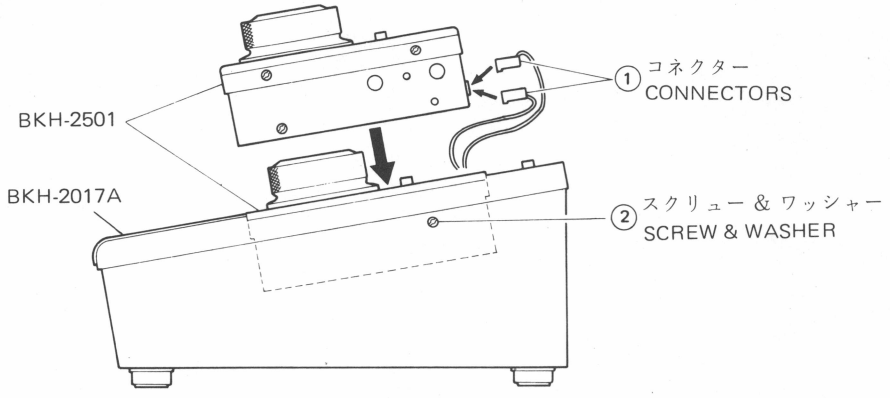



### 2-4-2. BKH-2017A への取り付け

① BKH-2017A 内部に収納されている 2 個のコネクター CN701（10ピン）と CN702（26ピン）を本機に接続する。
本機のコネクターについているレバーで必ずロックすること。
② 本機を BKH-2017A へ載せ，BKH-2017A の付属のねじ B3×14 と平ワッシャー（左右各 1 組）を使って留める。

### 2-4-2. Mounting to BKH-2017A

① Connect two connectors, CN701 (10 pins) and CN702 (26 pins), mounted in the BKH-2017A to the BKH-2501.
Be sure to lock them using the connector levers.
② Mount the BKH-2501 on the BKH-2017A using the B 3 x 14 screws and flat washers supplied with the BKH-2017A.



## 2-5. ブザーの音量調整

ブザーの音量は DP-37 基板の◐RV3 及び◐RV4 でそれぞれ単独に調整することができる。

◐RV3；連続アラーム音の調整が可能。

◐RV4；ENTRY IN/OUT ボタン，AUDIO SPLIT IN/OUT ボタン，IN/OUT ボタン，AUDIO IN/OUT ボタン，及び RESET ボタンを押した時の単発打鍵音の調整が可能。

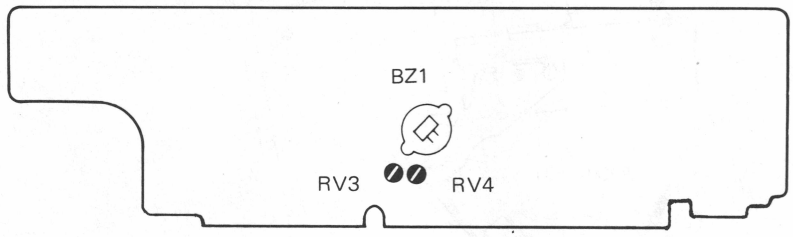
## 2-5.VOLUME CONTROL OF BUZZER

The volume of the buzzer can be adjusted separately by ◐ RV3 and ◐ RV4 on the DP-37 board.

◐ RV3; Adjusts the volume of the continuous alarm sound.

◐ RV4; Adjusts a single stroke-sound when ENTRY IN/OUT, AUDIO SPLIT IN/OUT, IN/OUT, AUDIO IN/OUT or RESET button is pressed.

**DP-37 BOARD (component side)**



# 第３章　サービス インフォメーション
# SECTION 3. SERVICE INFORMATION

## 3-1. 外装取り外し

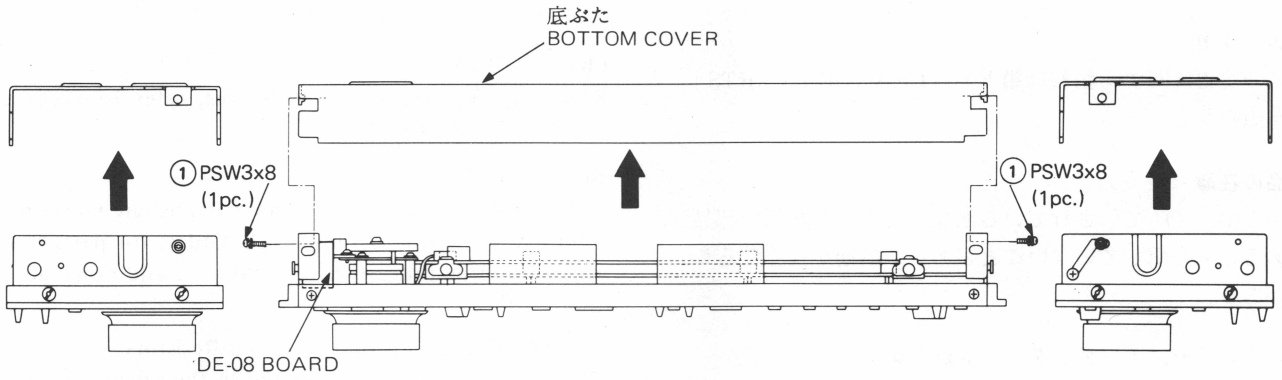
**底ぶた取り外し**

**注意：**底ぶたを取り外す時に DP-37 基板のコネクター CN701，CN702 についているレバーを折らないように注意すること。

## 3-1. CASE REMOVAL

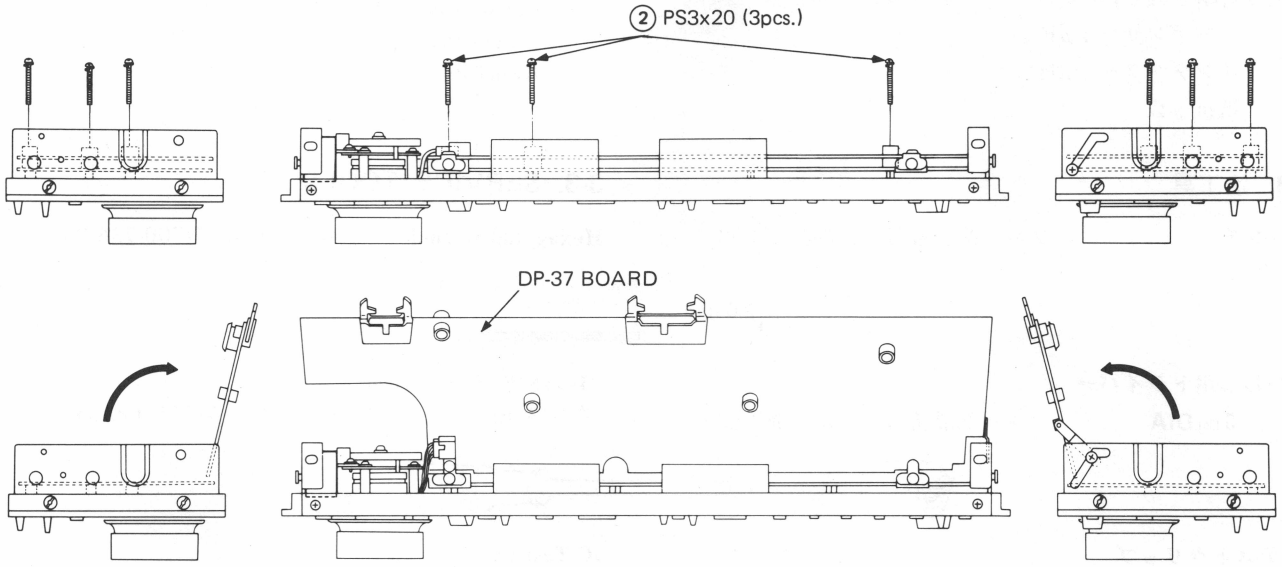
### Bottom Lid Removal

**Caution:** When removing the bottom lid, be careful not to break the levers of CN701, CN702 mounted on the DP-37 board.



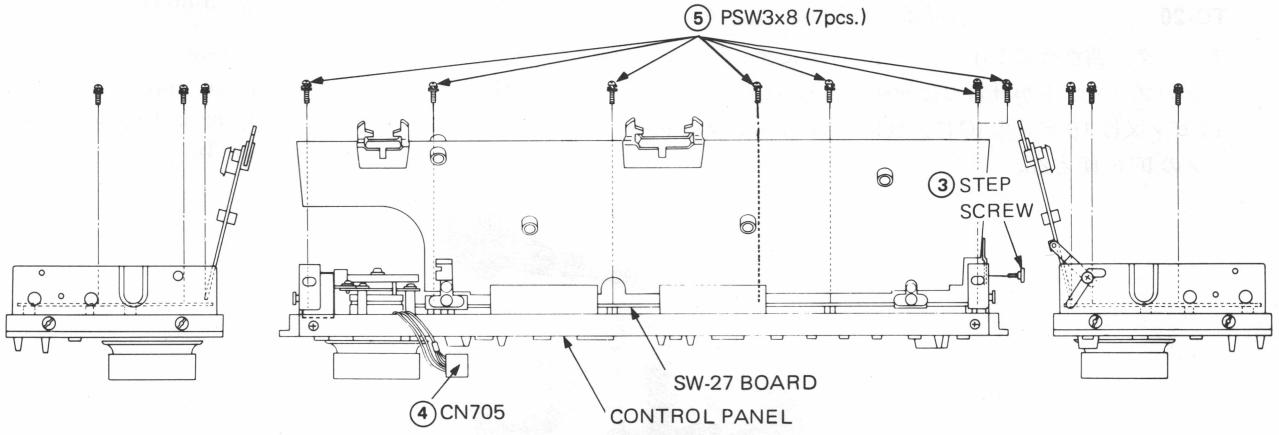

**DP-37基板取り外し**

### DP-37 Board Removal




**コントロールパネル取り外し**

### Control Panel Removal



## 3-2. 補修用部品注意事項

**部品の共通化**

ソニーから供給される部品はセットに実装されているものと異なることがある。これは部品の共通化，改良等によるものである。
分解図や電気部品表には現時点での共通化された部品が記載されている。

**部品の変更**

部品の変更に関する情報は第E章「CHANGED PARTS」を参照のこと。

**部品の在庫**

部品表中，() で示されている部品は交換頻度が低い部品であるので在庫していないことがあり，納期が長くなることがある。

**コンデンサー，インダクター，抵抗の単位**

回路図，電気部品表中，特に明記したものを除き，下記の単位は省略されている。

コンデンサー；μF
インダクター；μH
抵抗；Ω

## 3-2. NOTES ON REPAIR PARTS

**Standardization of Parts**

Repair parts supplied from Sony Parts Center may not be always identical with the parts which actually in use due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
This manual's exploded views and electrical spare parts lists are indicating the parts numbers of "the standardized genuine parts at present".

**Change of Parts**

Regarding engineering parts changes, refer to Section E. "CHANGED PARTS".

**Stock of Parts**

Parts marked with ( ) on the spare parts list are not normally required for routine service work. Orders for parts marked with ( ) will be processed, but allow for additional delivery time.

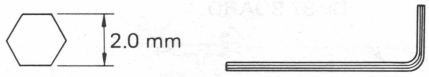
**Units for Capacitors, Inductors and Resistors**

The following units are assumed in the schematic diagram and electrical parts list unless otherwise specified:

Capacitors: μF
Inductors: μH
Resistors: ohm

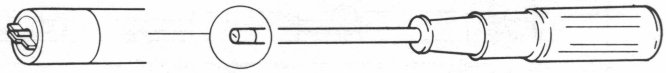
## 3-3. 治工具

**Lレンチ** ソニー部品番号 7-700-736-03




**とつねじ用ドライバー**

**3㎜DIA** ソニー部品番号 7-721-050-63



**ICテストクリップ**

**TC-16** ソニー部品番号 J-6041-770-A
**TC-20** ソニー部品番号 J-6041-780-A

チェック，調整時にDIPタイプICの足にオシロスコープのプローブをかけるのに便利である。TC-16は14ピン又は16ピンのICに，TC-20は18ピン又は20ピンのICに使える。

## 3-3. SERVICE TOOLS

**Hexagonal Wrench** Sony Part No. 7-700-736-03

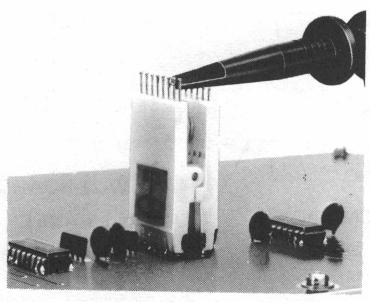
**"TOTSU" Screwdriver**

**3 mm DIA** Sony Part No. 7-721-050-63

**IC Test Clip**

**Type TC-16** Sony Part No. J-6041-770-A
**Type TC-20** Sony Part No. J-6041-780-A

When connecting the test probe to the terminal of DIP integrated circuit, these clips are convenient. Type TC-16 is for DIP 14-pin or 16-pin IC and Type TC-20 is for 18-pin or 20-pin IC.



# 第4章 調 整
# SECTION 4 ALIGNMENT

## 4-1. ブザー発振周波数調整

**Step 1.** DP-37 基板◐RV4 を ↻ 一杯に回しておく。

**Step 2.** コントロールパネル上の RESET キーを ON/OFF しながらブザー音が最大になるように DP-37 基板◐RV5 を調整する。

**Step 3.** ブザーの音量を◐RV4 で好みのレベルに調整する。

## 4-1. BUZZER OSC. FREQUENCY ADJUSTMENT

Step 1. Turn ◐ RV4 on DP-37 board ↻ full.

Step 2. Adjust ◐ RV5 on DP-37 board so that the volume of the alarm sound is maximum while switching RESET key ON/OFF on the control panel.

Step 3. Adjust the volume of the buzzer appropriately with ◐ RV4.

## 4-2. ダイヤルパルスアンプ調整

**Step 1.** 2現像オシロスコープを CHOP, DC, 2V/DIV, 2mSEC/DIV にセットし, DP-37 基板 TP 11 と TP 10 に接続する。

**Step 2.** JOG モードにし, サーチダイヤルを回しながら DP-37 基板◐RV1 を左右に回す。
◐RV1 を左に回して行った時に TP 11 にパルスが現れ始める点と右に回して行った時にパルスが現れ始める点との中央に◐RV1 をセットする。

**Step 3.** Step 2 と同様にして TP10 に対して◐RV2 を調整する。

**Step 4.** サーチダイヤルを FWD 方向, REV 方向に回しながら, パルスのタイミングが下図のようになっていることを確認する。

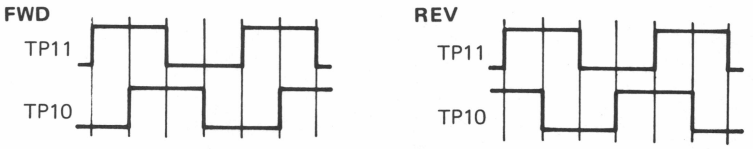
## 4-2. DIAL PULSE AMPLIFIER ADJUSTMENT

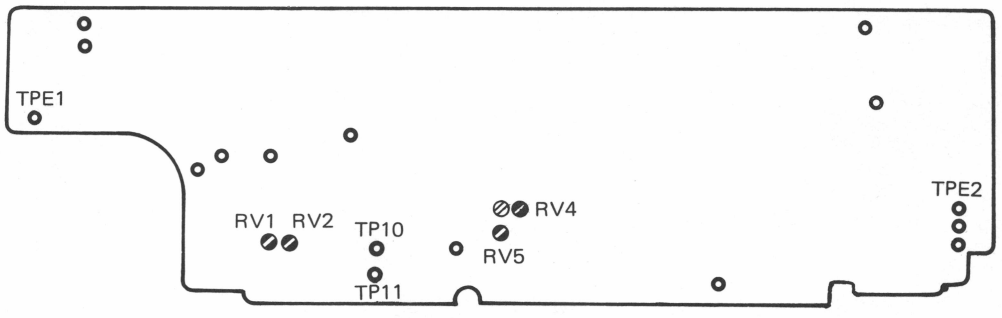
**Step 1.** Set a dual trace oscilloscope to CHOP, DC, 2V/DIV and 2 mSEC/DIV. Connect it to TP11 and TP10 on DP-37 board.

**Step 2.** Set the VTR to JOG mode and turn ◐ RV1 on DP-37 board CW (clockwise)/CCW (counterclockwise) while turning the search dial.
Set ◐ RV1 in the middle of the points where the pulse appears at TP11 by turning ◐ RV1 CW/CCW.

**Step 3.** Adjust ◐ RV2 for TP10, similarly as Step 2.

**Step 4.** Make sure that the timing of the pulse is shown below by turning the search dial in the direction of FWD/REV.

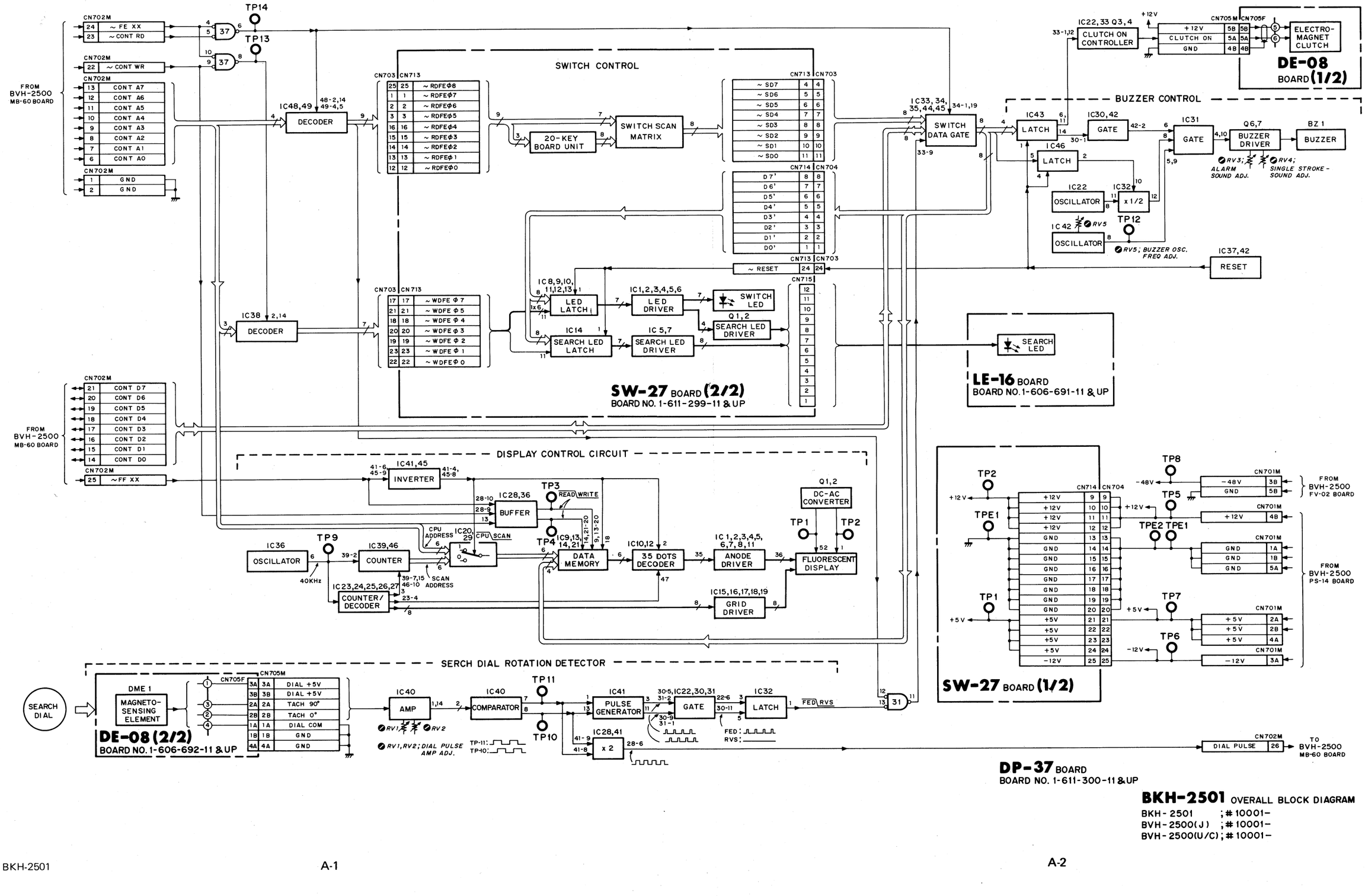



DP-37 Board (component side)

# SECTION A
# BLOCK DIAGRAM

## OVERALL BLOCK DIAGRAM

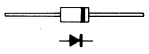



**BKH-2501** OVERALL BLOCK DIAGRAM

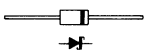
BKH-2501 ;# 10001-
BVH-2500(J) ;# 10001-
BVH-2500(U/C) ;# 10001-

# SECTION B
# SEMICONDUCTOR PIN ASSIGNMENTS

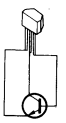

| TYPE | PAGE |
|---|---|
| 10E-2 | B-2 |
| 1N4148H | B-2 |
| 1S1555 | B-2 |
| 1S1585 | B-2 |
| 1S2076 | B-2 |
| 1S2473 | B-2 |
| 1SS106 | B-2 |
| 1SS119 | B-2 |
| 1SS120 | B-2 |
| 1SS133 | B-2 |
| 1SS148 | B-2 |
| 2SA1013 | B-2 |
| 2SA1026 | B-2 |
| 2SA1027R | B-2 |
| 2SA1115 | B-2 |
| 2SA1175 | B-2 |
| 2SA678 | B-2 |
| 2SA733 | B-2 |
| 2SA773 | B-2 |
| 2SA844 | B-2 |
| 2SB739 | B-2 |
| 2SB740 | B-2 |
| 2SC1364 | B-2 |
| 2SC1475 | B-2 |
| 2SC2458 | B-2 |
| 2SC2603 | B-2 |
| 2SC2785 | B-2 |
| 2SC634A | B-2 |
| 2SD774 | B-2 |
| 2SD789 | B-2 |
| AR2222S | B-2 |
| DM211 | B-2 |
| EAA5504S | B-2 |
| EBG5504S | B-2 |
| EBR5504S | B-2 |
| ERB12-02RK | B-2 |
| ERB12-04RK | B-2 |
| EQA02-09A | B-2 |
| EQA02-09B | B-2 |
| EQA02-09C | B-2 |
| GP08 | B-2 |
| HD14011BP | B-5 |
| HD14013BP | B-5 |
| HD14069UBP | B-5 |
| HD74LS155P | B-4 |
| HD74LS157P | B-4 |
| HD74LS244P | B-4 |
| HD74LS32P | B-4 |
| M54517P | B-2 |
| M74LS155P | B-4 |
| M74LS157P | B-4 |
| M74LS244P | B-4 |
| M74LS273P | B-4 |
| M74LS32P | B-4 |
| MB3614 | B-2 |
| MB74LS155 | B-4 |
| MB74LS157 | B-4 |
| MB74LS32 | B-4 |
| MB84011B | B-5 |
| MB84013B | B-5 |
| MB84069UB | B-5 |
| MB84520B | B-6 |
| MC14175BCP | B-5 |
| MSL917RS | B-2 |
| MSL9510RS | B-3 |
| MSL9650-01AS | B-3 |
| MSM4011RS | B-5 |
| PG2222SX | B-2 |
| RD9.1E | B-2 |
| SIB01-02 | B-2 |
| SN74LS138N | B-4 |
| SN74LS155N | B-4 |
| SN74LS157N | B-4 |
| SN74LS244P | B-4 |
| SN74LS273N | B-4 |
| SN74LS32N | B-4 |
| TC4011BP | B-5 |
| TC4013BP | B-5 |
| TC40175BP | B-5 |
| TC4030BP | B-5 |
| TC4069UBP | B-5 |
| TC4071BP | B-5 |
| TC4081BP | B-5 |
| TC4520BP | B-6 |
| U05G | B-2 |
| UPC324C | B-2 |
| UPD4011BC | B-5 |
| UPD4013BC | B-5 |
| UPD4030BC | B-5 |
| UPD4069UBC | B-5 |
| UPD4071BC | B-5 |
| UPD4081BC | B-5 |
| UPD5101LC-1 | B-6 |
| US1035 | B-2 |



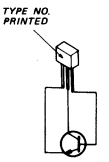
*10E-2*
*1N4148H*
*1S1555*
*1S1585*
*1S2076*
*1S2473*
*1SS119*
*1SS120*
*1SS133*
*1SS148*
*ERB12-02RK*
*ERB12-04RK*
*GP08*
*SIB01-02*
*US1035*



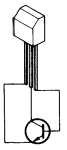
*1SS106*



*2SC2458*
*2SC2603*



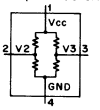

*2SC2785*

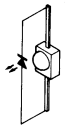


*2SD774*

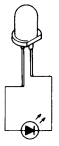
*DM211*

Magneto-Sensing Element
– Equivalent Circuit –

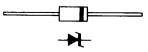


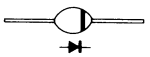
*AR2222S ; RED*
*PG2222SX ; GREEN*



*EAA5504S ; AMBER*
*EBG5504S ; GREEN*
*EBR5504S ; RED*

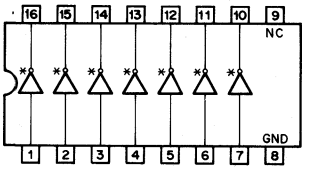


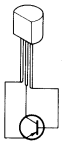
*EQA02- ? ? ?*
*RD ? ?E*



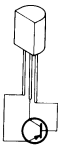
*U05G*

M54517P (MITSUBISHI)
INVERTER WITH OPEN-COLLECTOR
(DARLINGTON-CONNECTED TRANSISTOR ARRAY)
— TOP VIEW —



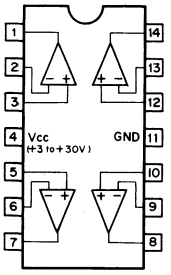



*2SA733*
*2SA844*

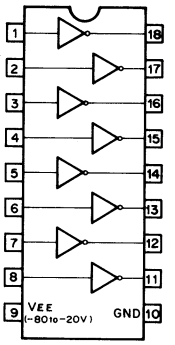


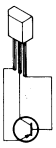
*2SA1013*
*2SA773*
*2SB739*
*2SB740*

MB3614 (FUJITSU)
uPC324C (NEC)
QUAD. OP AMPLIFIER
— TOP VIEW —



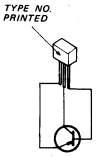

MSL917RS (OKI)
VACUUM FLUORESCENT DISPLAY DRIVER
— TOP VIEW —



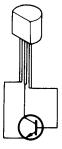
*2SA1026*
*2SA1027R*
*2SA678*

*2SA1115*

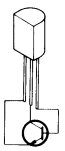



*2SA1175*

*2SC634A*

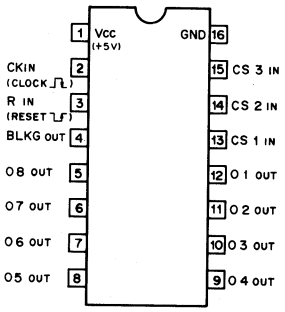


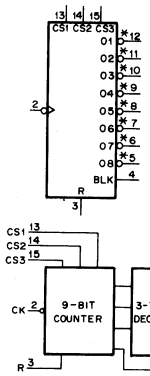
*2SC1364*



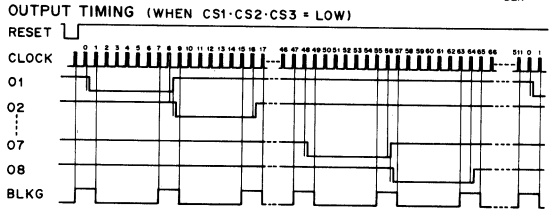
*2SC1475*
*2SD789*

MSL9510RS (OKI)
8-BIT DIGIT SCAN COUNTER/DECODER
FOR FLUORESCENT DISPLAY (OPEN COLLECTOR)
— TOP VIEW —




OUTPUT TIMING (WHEN CS1·CS2·CS3 = LOW)



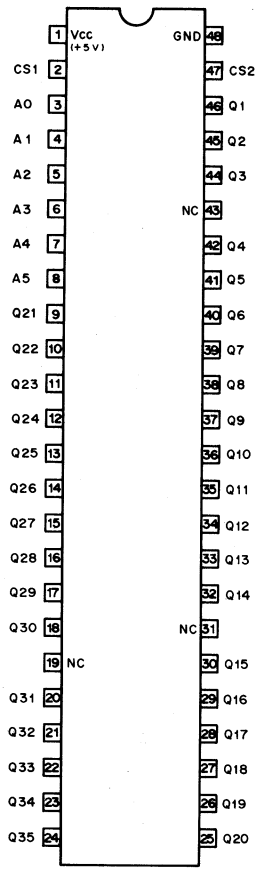

FUNCTION TABLE

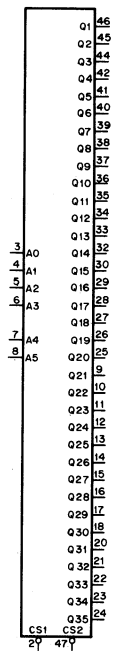
| CS1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
|---|---|---|---|---|---|---|---|---|
| CS2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| CS3 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| CLOCK | | | | | | | | |
| 0～63 | ○ | | | | | | | |
| 64～127 | | ○ | | | | | | |
| 128～191 | | | ○ | | | | | |
| 192～255 | | | | ○ | | | | |
| 256～319 | | | | | ○ | | | |
| 320～383 | | | | | | ○ | | |
| 384～447 | | | | | | | ○ | |
| 448～511 | | | | | | | | ○ |

0 : LOW LEVEL
1 : HIGH LEVEL

ROUND "○" : COUNT
BLANK : NO COUNT

MSL9650-01AS (OKI)
35-BIT PARALLEL OUT CHARACTOR GENERATOR
— TOP VIEW —



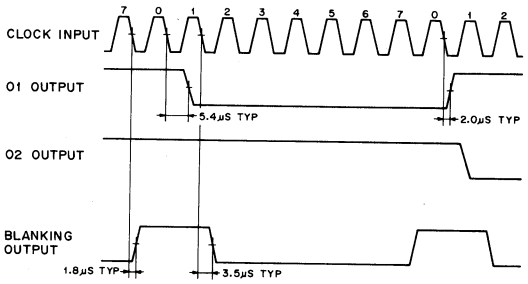




FUNCTION

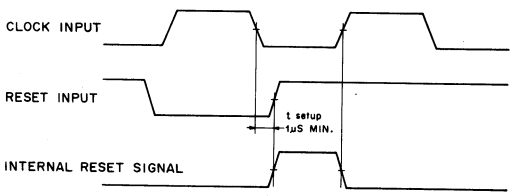
| CS1 | CS2 | OUTPUT |
|---|---|---|
| 1 | X | BLANKING |
| X | 1 | BLANKING |
| 0 | 0 | ACTIVE |

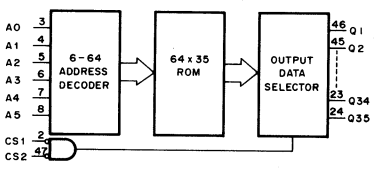
0 : LOW LEVEL
1 : HIGH LEVEL
X : DON'T CARE

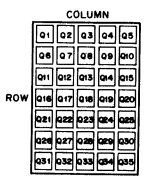
DETAIL OF OUTPUT TIMING ($R_L$ = 7KΩ)

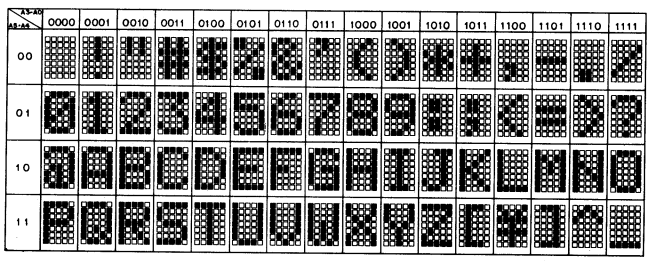



RESET TIMING

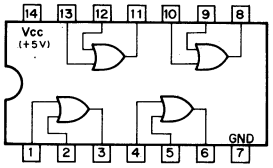


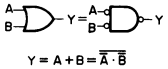



SN7432N (TI)
SN74LS32N (TI)
SN74S32N (TI)
HD74LS32P (HITACHI)
M74LS32P (MITSUBISHI)
MB74LS32 (FUJITSU)
TTL 2-INPUT POSITIVE-OR GATE
— TOP VIEW —

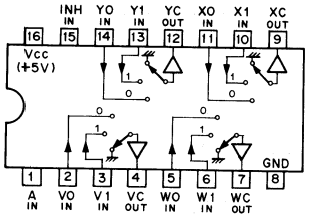


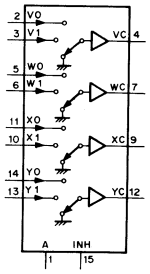




| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

0;LOW LEVEL
1;HIGH LEVEL

SN74157N (TI)
SN74L157N (TI)
SN74LS157N (TI)
SN74S157N (TI)
HD74LS157P (HITACHI)
M74LS157P (MITSUBISHI)
MB74LS157 (FUJITSU)
TTL 2-LINE-TO-1-LINE DATA SELECTOR/MULTIPLEXER
— TOP VIEW —

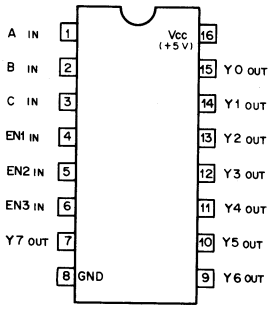


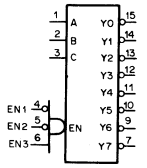




| CONT. IN | | ON CHANNEL |
|---|---|---|
| INH | A | |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | GND |

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE

SN74LS138N (TI)
SN74S138N (TI)
HD74LS138P (HITACHI)
M74LS138P (MITSUBISHI)
MB74LS138 (FUJITSU)
TTL 3-TO-8-LINE DECODER/DEMULTIPLEXER
— TOP VIEW —



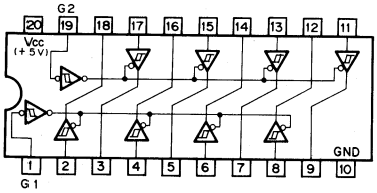




| INPUTS | | | | OUTPUTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EN | C | B | A | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |
| 0 | X | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

$EN = \overline{EN1}\cdot\overline{EN2}\cdot EN3$

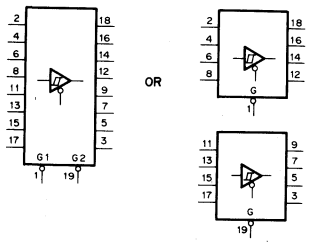
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

SN74LS244N (TI)
HD74LS244P (HITACHI)
M74LS244P (MITSUBISHI)
TTL 3-STATE SCHMITT TRIGGER BUFFER/DRIVER
— TOP VIEW —

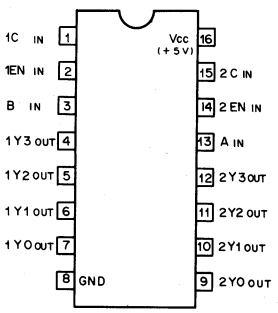


| G | A | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | HI-Z |

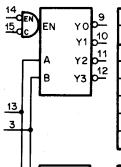
0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE
HI-Z;HIGH IMPEDANCE




SN74155N (TI)
SN74LS155N (TI)
HD74LS155P (HITACHI)
M74LS155P (MITSUBISHI)
MB74LS155 (FUJITSU)
TTL DUAL 2-TO-4-LINE DECODER/DEMULTIPLEXER
— TOP VIEW —



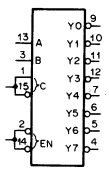

DUAL 2-TO-4-LINE DECODER




| INPUTS | | | | OUTPUTS | | | |
|---|---|---|---|---|---|---|---|
| EN | C | B | A | Y3 | Y2 | Y1 | Y0 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| X | 1 | X | X | 1 | 1 | 1 | 1 |
| 1 | X | X | X | 1 | 1 | 1 | 1 |

| EN | C | B | A | Y3 | Y2 | Y1 | Y0 |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| X | 0 | X | X | 1 | 1 | 1 | 1 |
| 1 | X | X | X | 1 | 1 | 1 | 1 |

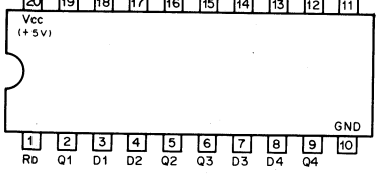
3-TO-8-LINE DECODER

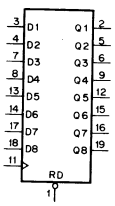



| INPUTS | | | | OUTPUTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EN | C | B | A | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | X | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

0;LOW LEVEL 1;HIGH LEVEL X;DON'T CARE

SN74273N (TI)
SN74LS273N (TI)
M74LS273P (MITSUBISHI)
TTL D-TYPE FLIP-FLOP WITH DIRECT RESET
— TOP VIEW —

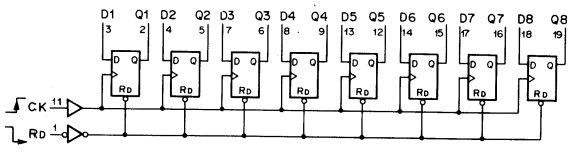


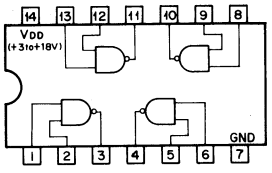

EACH FLIP-FLOP

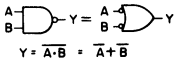
| INPUTS | | | OUT |
|---|---|---|---|
| RD | CK | D | Q |
| 0 | X | X | 0 |
| 1 | ↑ | 0 | 0 |
| 1 | ↑ | 1 | 1 |
| 1 | 0 | X | Q0 |

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE



TC4011BP (TOSHIBA)
HD14011BP (HITACHI)
MB84011B (FUJITSU)
MSM4011RS (OKI)
uPD4011BC (NEC)
MC14011BCP (MOTOROLA)
C-MOS 2-INPUT NAND GATE
— TOP VIEW —

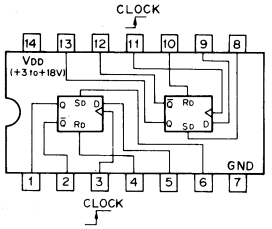



| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

O; LOW LEVEL
1; HIGH LEVEL

TC4013BP (TOSHIBA)
C-MOS D-TYPE FLIP FLOP WITH DIRECT SET/RESET
— TOP VIEW —




DIRECT R-S FLIP FLOP

| Sd | Rd | Q | Q̄ |
|---|---|---|---|
| 0 | 0 | Qn | Q̄n |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |

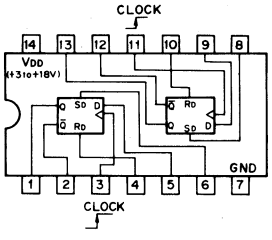
D-TYPE FLIP FLOP

| CKn | CKn+1 |
|---|---|
| D | Q |
| 0 | 0 |
| 1 | 1 |

CLOCK CK; ⌐¬
CKn; BEFORE CLOCK
CKn+1; AFTER CLOCK

O; LOW LEVEL
1; HIGH LEVEL

HD14013BP (HITACHI)
MB84013B (FUJITSU)
uPD4013BC (NEC)
MC14013BCP (MOTOROLA)
C-MOS D-TYPE FLIP-FLOP WITH DIRECT SET/RESET
— TOP VIEW —




DIRECT R-S FLIP FLOP

| Sd | Rd | Q | Q̄ |
|---|---|---|---|
| 0 | 0 | Qn | Q̄n |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 |

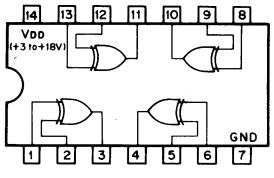
D-TYPE FLIP FLOP

| CKn | CKn+1 |
|---|---|
| D | Q |
| 0 | 0 |
| 1 | 1 |

CLOCK CK; ⌐¬
CKn; BEFORE CLOCK
CKn+1; AFTER CLOCK

O; LOW LEVEL
1; HIGH LEVEL

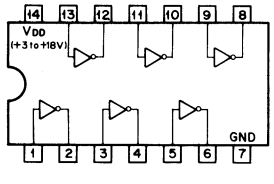
TC4030BP (TOSHIBA)
uPD4030BC (NEC)
MC14507CP (MOTOROLA)
C-MOS EXCLUSIVE OR GATE
— TOP VIEW —

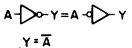


| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

O; LOW LEVEL
1; HIGH LEVEL

TC4069UBP (TOSHIBA)
HD14069UBP (HITACHI)
MB84069UB (FUJITSU)
uPD4069UBC (NEC)
MC14069UBCP (MOTOROLA)
C-MOS INVERTER
— TOP VIEW —

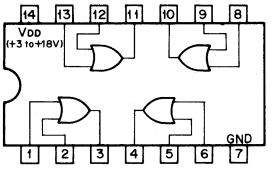


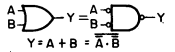




| A | Y |
|---|---|
| 0 | 1 |
| 1 | 0 |

O; LOW LEVEL
1; HIGH LEVEL

TC4071BP (TOSHIBA)
uPD4071BC (NEC)
MC14071BCP (MOTOROLA)
C-MOS 2-INPUT OR GATE
— TOP VIEW —

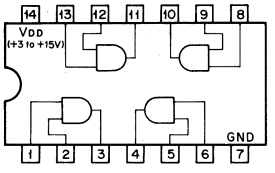


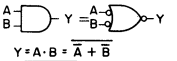




| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

O; LOW LEVEL
1; HIGH LEVEL

TC4081BP (TOSHIBA)
uPD4081BC (NEC)
MC14081BCP (MOTOROLA)
C-MOS 2-INPUT AND GATE
— TOP VIEW —

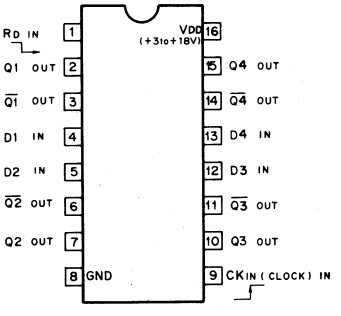


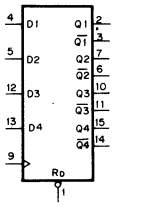




| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

O; LOW LEVEL
1; HIGH LEVEL

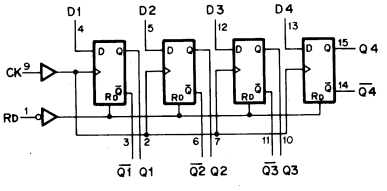
TC40175BP (TOSHIBA)
MC14175BCP (MOTOROLA)
C-MOS D-TYPE FLIP-FLOP
— TOP VIEW —



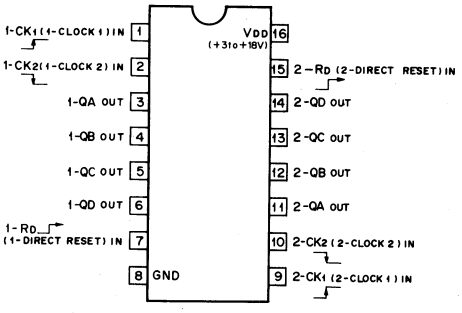




| CK | D | RD | Q | Q̄ |
|---|---|---|---|---|
| ⌐¬ | 0 | 1 | 0 | 1 |
| ⌐¬ | 1 | 1 | 1 | 0 |
| ⌐ | X | 1 | Q0 | Q̄0 |
| X | X | 0 | 0 | 1 |

O; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

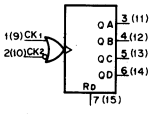


TC4520BP (TOSHIBA)
MB84520B (FUJITSU)
MC14520BCP (MOTOROLA)
C-MOS DUAL 4-BIT BINARY UP COUNTER
— TOP VIEW —



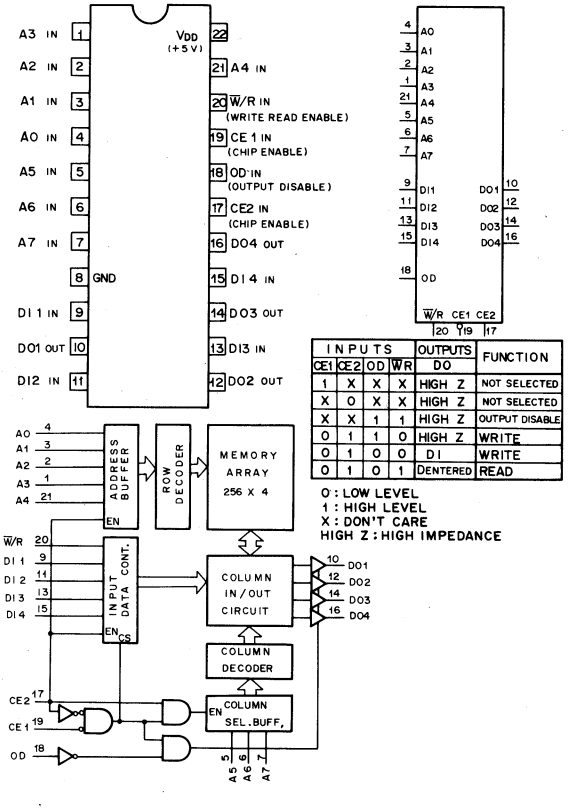

| STATE | OUTPUTS QD | QC | QB | QA |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 2 | 0 | 0 | 1 | 0 |
| 3 | 0 | 0 | 1 | 1 |
| 4 | 0 | 1 | 0 | 0 |
| 5 | 0 | 1 | 0 | 1 |
| 6 | 0 | 1 | 1 | 0 |
| 7 | 0 | 1 | 1 | 1 |
| 8 | 1 | 0 | 0 | 0 |
| 9 | 1 | 0 | 0 | 1 |
| 10 | 1 | 0 | 1 | 0 |
| 11 | 1 | 0 | 1 | 1 |
| 12 | 1 | 1 | 0 | 0 |
| 13 | 1 | 1 | 0 | 1 |
| 14 | 1 | 1 | 1 | 0 |
| 15 | 1 | 1 | 1 | 1 |

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE




| CK1 | CK2 | RD | ACTION |
|---|---|---|---|
| ↓ | 1 | 0 | INCREMENT COUNTER |
| 0 | ↓ | 0 | INCREMENT COUNTER |
| ↑ | X | 0 | NO CHANGE |
| X | ↓ | 0 | NO CHANGE |
| ↓ | 0 | 0 | NO CHANGE |
| 1 | ↑ | 0 | NO CHANGE |
| X | X | 1 | QA THRU QD = 0 |

uPD5101LC-1 (NEC) (ACCESS TIME = 450 nS)
C-MOS 1024-BIT(256x4) STATIC RAM
— TOP VIEW —







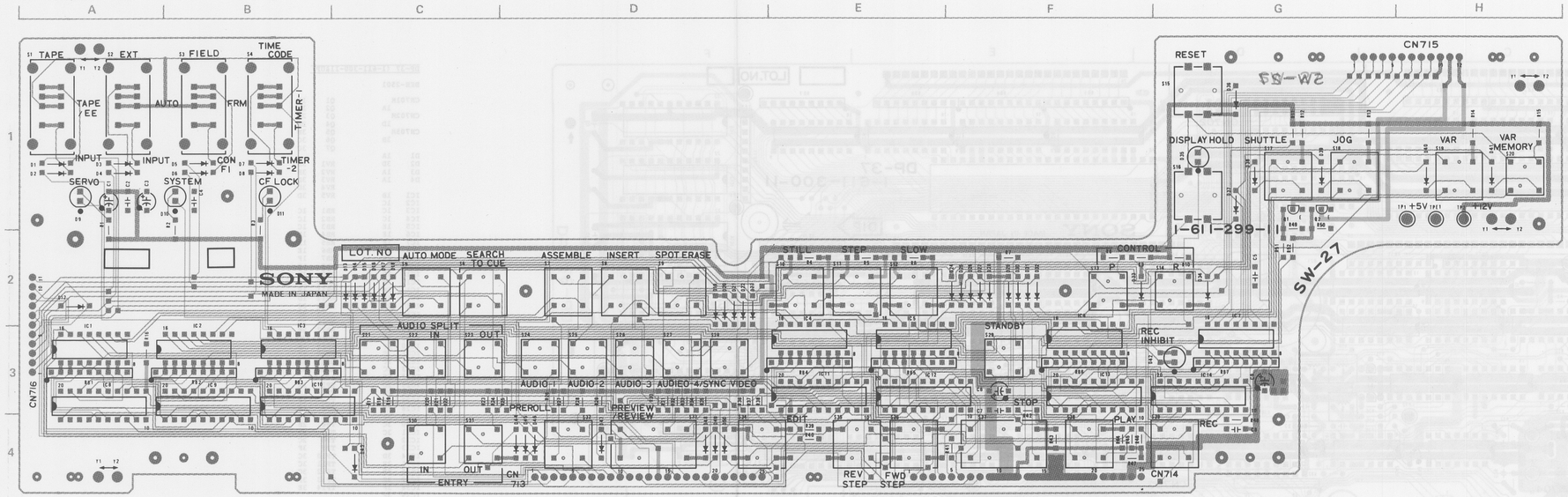
| INPUTS CE1 | CE2 | OD | W/R | OUTPUTS DO | FUNCTION |
|---|---|---|---|---|---|
| 1 | X | X | X | HIGH Z | NOT SELECTED |
| X | 0 | X | X | HIGH Z | NOT SELECTED |
| X | X | 1 | 1 | HIGH Z | OUTPUT DISABLE |
| 0 | 1 | 1 | 0 | HIGH Z | WRITE |
| 0 | 1 | 0 | 0 | DI | WRITE |
| 0 | 1 | 0 | 1 | DENTERED | READ |

0 : LOW LEVEL
1 : HIGH LEVEL
X : DON'T CARE
HIGH Z : HIGH IMPEDANCE

# SECTION C. SCHEMATIC DIAGRAM AND BOARD LAYOUT

## SW-27 BOARD (1-611-299-11)

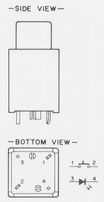
Component Side



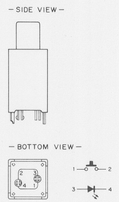

■ 1-611-299-11
COMPONENT SIDE

■ 1-611-299-11
SOLDER SIDE

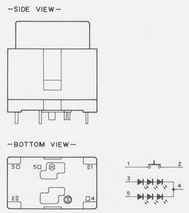
S5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 32, 34, 35, 36, 38, 39




S13, 14, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31




S33, 37



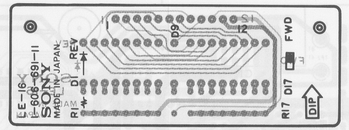

SW-27 (1-611-299-11&UP)

BKH-2501

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| D1 | 1A | D32 | 2F | IC11 | 3E | S15 | 1G |
| D2 | 1A | D33 | 2F | IC12 | 3E | S16 | 1G |
| D3 | 1A | D34 | 2G | IC13 | 3F | S17 | 1G |
| D4 | 1A | D35 | 1G | IC14 | 3G | S18 | 1G |
| D5 | 1B | D36 | 1G | | | S19 | 1H |
| D6 | 1B | D37 | 1G | Q1 | 1G | S20 | 1H |
| D7 | 1B | D38 | 1G | Q2 | 1G | S21 | 3C |
| D8 | 1B | D39 | 1G | | | S22 | 3C |
| D9 | 1A | D40 | 1H | RB1 | 3A | S23 | 3C |
| D10 | 1B | D41 | 1H | RB2 | 3B | S24 | 3D |
| D11 | 1B | D42 | 3G | RB3 | 3B | S25 | 3D |
| D13 | 2C | D43 | 4C | RB4 | 3E | S26 | 3D |
| D14 | 2C | D44 | 4D | RB5 | 3E | S27 | 3D |
| D15 | 2C | D45 | 4D | RB6 | 3F | S28 | 3D |
| D16 | 2C | D46 | 4D | RB7 | 3G | S29 | 3F |
| D17 | 2C | D47 | 4D | | | S30 | 4C |
| D18 | 2C | D48 | 4D | S1 | 1A | S31 | 4C |
| D19 | 2D | D49 | 4D | S2 | 1A | S32 | 4D |
| D20 | 2D | D50 | 4D | S3 | 1B | S33 | 4D |
| D21 | 2D | | | S4 | 1B | S34 | 4D |
| D22 | 2D | IC1 | 3A | S5 | 2C | S35 | 4E |
| D23 | 2D | IC2 | 3B | S6 | 2C | S36 | 4E |
| D24 | 2F | IC3 | 3B | S7 | 2D | S37 | 4F |
| D25 | 2F | IC4 | 3E | S8 | 2D | S38 | 4F |
| D26 | 2F | IC5 | 3E | S9 | 2D | S39 | 4G |
| D27 | 2F | IC6 | 3F | S10 | 2E | | |
| D28 | 2F | IC7 | 3G | S11 | 2E | TP1 | 1H |
| D29 | 2F | IC8 | 3A | S12 | 2E | TP2 | 1H |
| D30 | 2F | IC9 | 3B | S13 | 2F | | |
| D31 | 2F | IC10 | 3B | S14 | 2G | TPE1 | 1H |

## LE-16 BOARD (1-606-691-11)

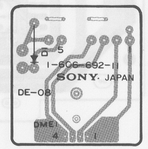
Component Side




1-606-691-11
COMPONENT SIDE

## DE-08 BOARD (1-606-692-11)

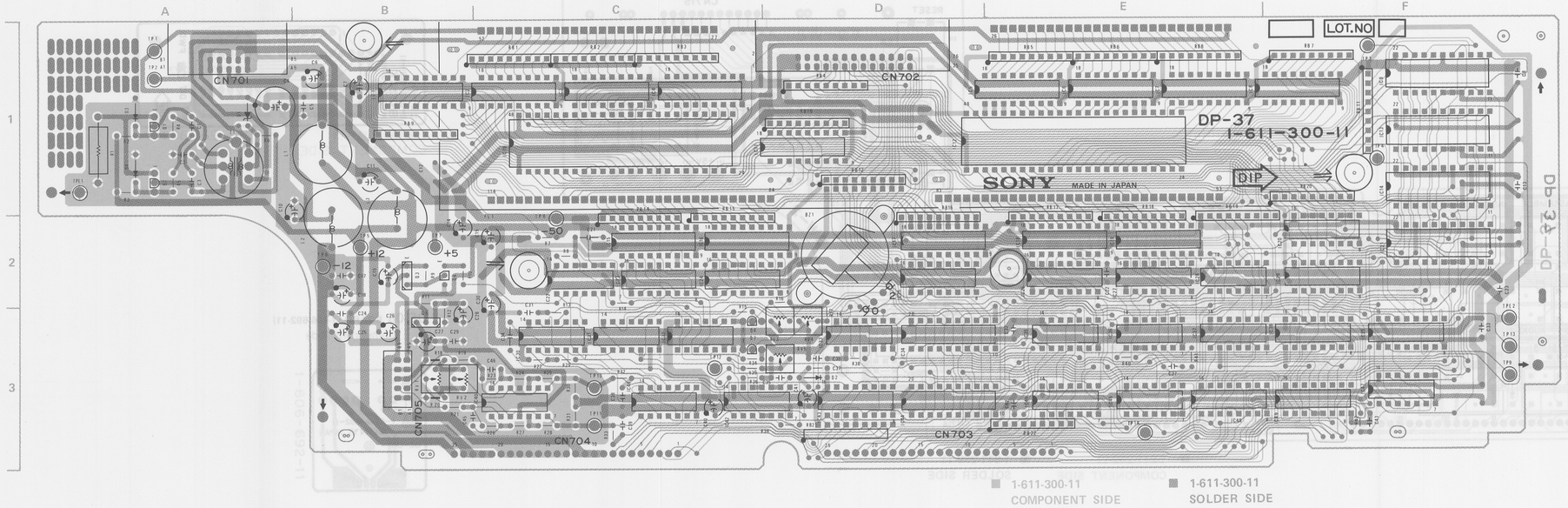
Component Side



DP-37 DP-37

## DP-37 BOARD (1-611-300-11)

Component Side




■ 1-611-300-11 COMPONENT SIDE

■ 1-611-300-11 SOLDER SIDE

**RB1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22**

DP-37 (1-611-300-11GUP)

BKH-2501

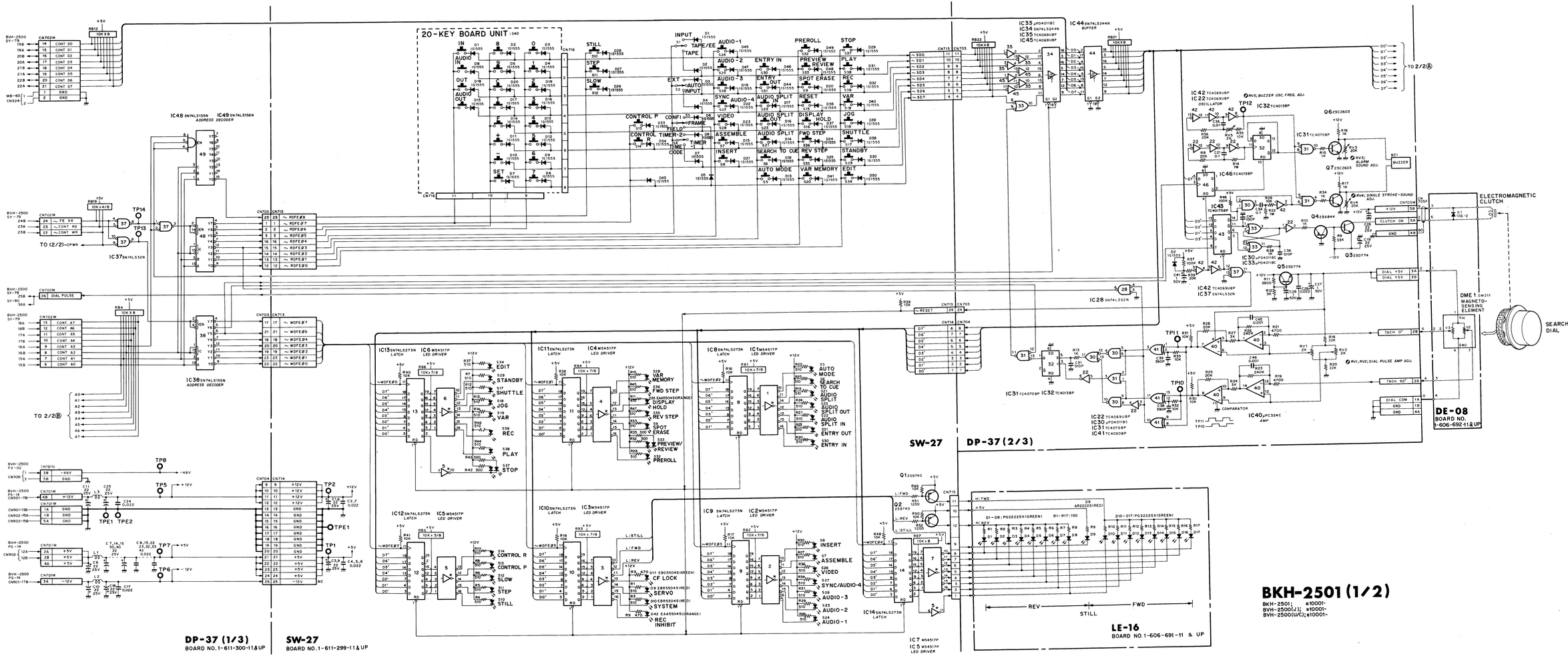
| | | | |
|---|---|---|---|
| CN701M | | Q1 | 1A |
| | 1A | Q2 | 1A |
| CN702M | | Q3 | 2B |
| | 1D | Q4 | 2B |
| CN705M | | Q5 | 3B |
| | 3B | Q6 | 3C |
| | | Q7 | 3C |
| D1 | 1A | | |
| D2 | 3D | RV1 | 3B |
| D3 | 1A | RV2 | 3B |
| D4 | 1A | RV3 | 3D |
| | | RV4 | 3D |
| IC1 | 1B | RV5 | 3D |
| IC2 | 1C | | |
| IC3 | 1C | RB1 | 1C |
| IC4 | 1C | RB2 | 1C |
| IC5 | 1E | RB3 | 1C |
| IC6 | 1E | RB4 | 1D |
| IC7 | 1E | RB5 | 1E |
| IC8 | 1F | RB6 | 1E |
| IC9 | 1F | RB7 | 1F |
| IC10 | 1C | RB8 | 1E |
| IC11 | 1D | RB9 | 1B |
| IC12 | 1E | RB10 | 1D |
| IC13 | 1F | RB11 | 1F |
| IC14 | 1F | RB12 | 1D |
| IC15 | 2C | RB14 | 2C |
| IC16 | 2C | RB15 | 2C |
| IC17 | 2D | RB16 | 2D |
| IC18 | 2E | RB17 | 2E |
| IC19 | 2E | RB18 | 2E |
| IC20 | 2F | RB19 | 2E |
| IC21 | 2F | RB20 | 1F |
| IC22 | 2C | RB21 | 3D |
| IC23 | 2C | RB22 | 3E |
| IC24 | 2C | | |
| IC25 | 2D | TP1 | 1A |
| IC26 | 2E | TP2 | 1A |
| IC27 | 2E | TP3 | 1F |
| IC28 | 2E | TP4 | 1F |
| IC29 | 2F | TP5 | 2B |
| IC30 | 3C | TP6 | 2B |
| IC31 | 3C | TP7 | 2B |
| IC32 | 3C | TP8 | 2C |
| IC33 | 3D | TP9 | 3F |
| IC34 | 3D | TP10 | 3C |
| IC35 | 3E | TP11 | 3C |
| IC36 | 3E | TP12 | 3C |
| IC37 | 3E | TP13 | 3F |
| IC38 | 3F | TP14 | 3E |
| IC39 | 3F | | |
| IC40 | 3C | TPE1 | 1A |
| IC41 | 3C | TPE2 | 3F |
| IC42 | 3C | | |
| IC43 | 3D | | |
| IC44 | 3D | | |
| IC45 | 3E | | |
| IC46 | 3E | | |
| IC47 | 3F | | |
| IC48 | 3E | | |
| IC49 | 3F | | |

**BKH-2501(1/2)** SW-27, DP-37(1/3)(2/3), LE-16, DE-08

SW-27, DP-37(1/3)(2/3), LE-16, DE-08 **BKH-2501(1/2)**

**BKH-2501(1/2)**

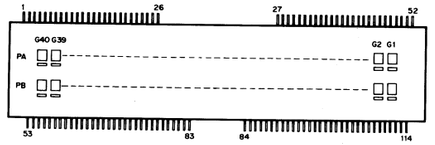
Function Control



# BKH-2501(2/2)

Function Control

FL1
DC40026B2 (ITROM)
40 x 2 DIGITS FLUORESCENT CHARACTER DISPLAY
— TOP VIEW —



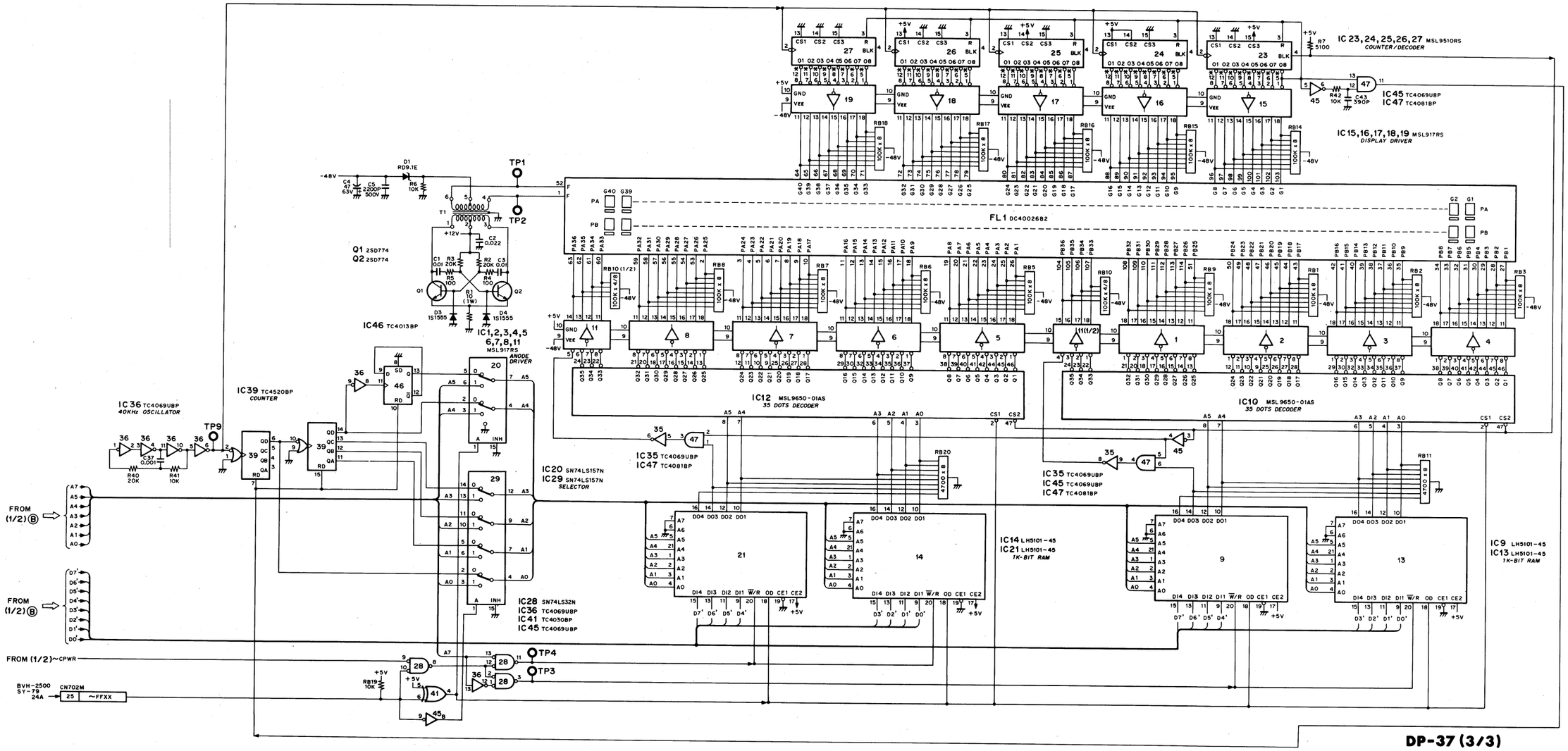

F : FILAMENT
G : GRID
P : PLATE

| P1 | P2 | P3 | P4 | P5 |
|---|---|---|---|---|
| P6 | P7 | P8 | P9 | P10 |
| P11 | P12 | P13 | P14 | P15 |
| P16 | P17 | P18 | P19 | P20 |
| P21 | P22 | P23 | P24 | P25 |
| P26 | P27 | P28 | P29 | P30 |
| P31 | P32 | P33 | P34 | P35 |

P36

PIN ASSIGNMENT

| PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN | PIN NO | ASSIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | 11 | PA16 | 21 | PA6 | 31 | PB5 | 41 | PB15 | 51 | PB25 | 61 | PA34 | 71 | G33 | 81 | G23 | 91 | G13 | 101 | G3 | 111 | PB29 |
| 2 | PA25 | 12 | PA15 | 22 | PA5 | 32 | PB6 | 42 | PB16 | 52 | F | 62 | PA35 | 72 | G32 | 82 | G22 | 92 | G12 | 102 | G2 | 112 | PB28 |
| 3 | PA24 | 13 | PA14 | 23 | PA4 | 33 | PB7 | 43 | PB17 | 53 | PA26 | 63 | PA36 | 73 | G31 | 83 | G21 | 93 | G11 | 103 | G1 | 113 | PB27 |
| 4 | PA23 | 14 | PA13 | 24 | PA3 | 34 | PB8 | 44 | PB18 | 54 | PA27 | 64 | G40 | 74 | G30 | 84 | G20 | 94 | G10 | 104 | PB36 | 114 | PB26 |
| 5 | PA22 | 15 | PA12 | 25 | PA2 | 35 | PB9 | 45 | PB19 | 55 | PA28 | 65 | G39 | 75 | G29 | 85 | G19 | 95 | G9 | 105 | PB35 | | |
| 6 | PA21 | 16 | PA11 | 26 | PA1 | 36 | PB10 | 46 | PB20 | 56 | PA29 | 66 | G38 | 76 | G28 | 86 | G18 | 96 | G8 | 106 | PB34 | | |
| 7 | PA20 | 17 | PA10 | 27 | PB1 | 37 | PB11 | 47 | PB21 | 57 | PA30 | 67 | G37 | 77 | G27 | 87 | G17 | 97 | G7 | 107 | PB33 | | |
| 8 | PA19 | 18 | PA9 | 28 | PB2 | 38 | PB12 | 48 | PB22 | 58 | PA31 | 68 | G36 | 78 | G26 | 88 | G16 | 98 | G6 | 108 | PB32 | | |
| 9 | PA18 | 19 | PA8 | 29 | PB3 | 39 | PB13 | 49 | PB23 | 59 | PA32 | 69 | G35 | 79 | G25 | 89 | G15 | 99 | G5 | 109 | PB31 | | |
| 10 | PA17 | 20 | PA7 | 30 | PB4 | 40 | PB14 | 50 | PB24 | 60 | PA33 | 70 | G34 | 80 | G24 | 90 | G14 | 100 | G4 | 110 | PB30 | | |

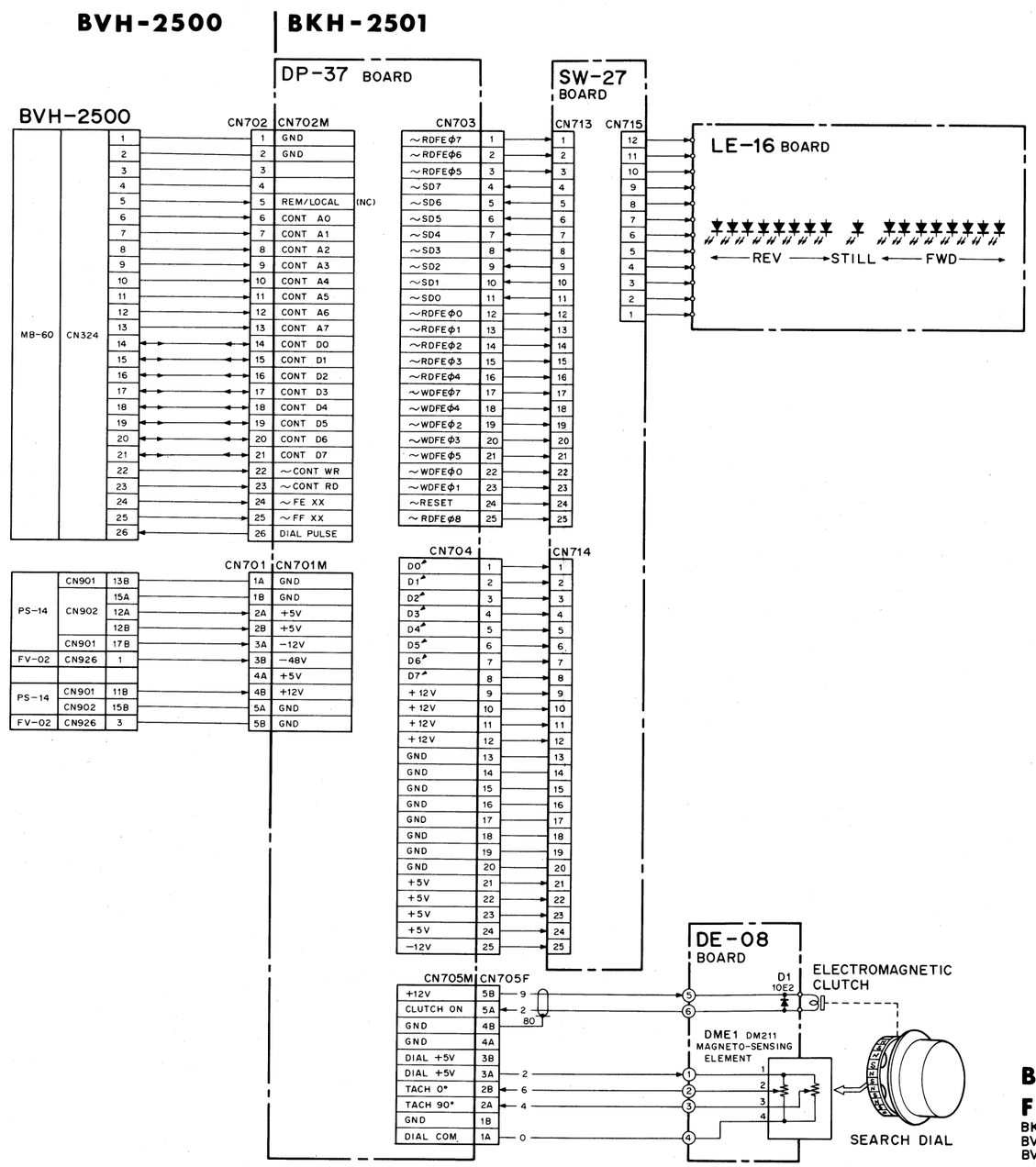



**DP-37 (3/3)**
BOARD NO. 1-611 - 300-11 & UP

**BKH-2501(2/2)**
BKH-2501; #10001-
BVH-2500(J); #10001-
BVH-2500(U/C); #10001-

FRAME | FRAME

## FRAME WIRING

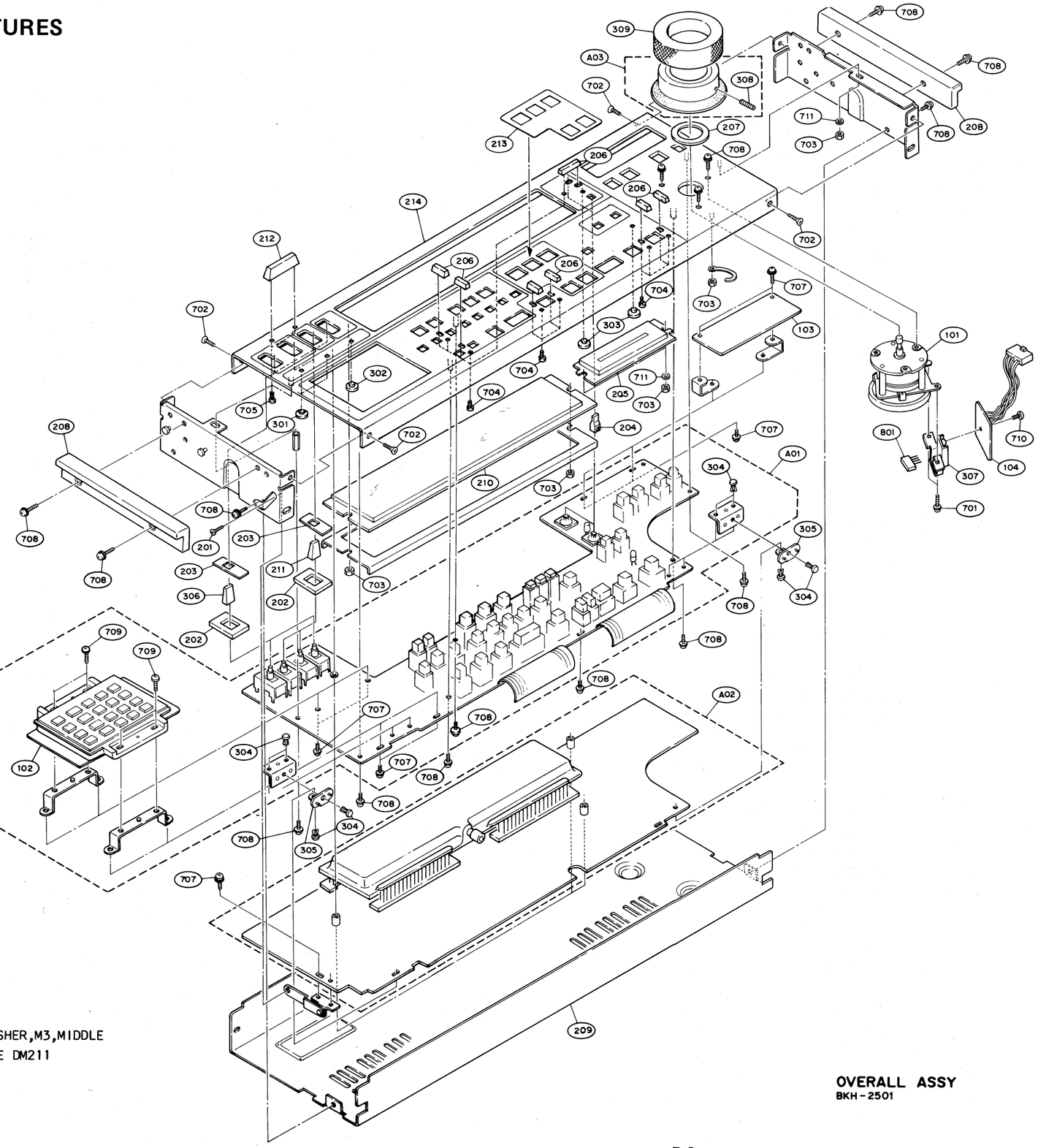



**BKH-2501**
**FRAME WIRING**
BKH-2501; #10001-
BVH-2500(J); #10001-
BVH-2500(U/C); #10001-

# SECTION D
# REPLACEABLE PARTS & OPTIONAL FIXTURES

OVERALL ASSY (BKH-2501)

| No. | | Part No. | Description |
|---|---|---|---|
| A01 | () | A-6017-098-A | COMPLETE PCB,SW-27 |
| A02 | () | A-6017-099-A | COMPLETE PCB,DP-37 |
| A03 | () | A-6031-042-A | KNOB ASSY,JOG DIAL |
| 101 | | 1-454-306-00 | CLUTCH,ELECTROMAGNETIC |
| 102 | | 1-464-194-00 | KEY BOARD UNIT(20 KEY) |
| 103 | () | 1-606-691-00 | PC BOARD,LE-16 |
| 104 | () | 1-606-692-00 | PC BOARD,DE-08 |
| 201 | | 2-236-956-00 | SCREW,STEP |
| 202 | () | 2-252-615-00 | CUSHION,SWITCH |
| 203 | () | 2-252-623-00 | PLATE,LEVER SWITCH |
| 204 | | 2-252-640-00 | KNOB,TACT SWITCH |
| 205 | () | 2-295-989-00 | FILTER(4),INDICATION |
| 206 | () | 2-295-991-00 | GUARD,SWITCH |
| 207 | () | 2-295-992-00 | FELT |
| 208 | () | 2-360-702-00 | SASH,CONTROL PANEL |
| 209 | () | 2-360-705-00 | LID,REAR,CONTROL PANEL |
| 210 | () | 2-360-710-00 | FILTER(3),INDICATION |
| 211 | | 2-360-734-00 | KNOB(3),LEVER SWITCH |
| 212 | () | 2-375-729-01 | GUARD(2),KNOB |
| 213 | () | 2-375-730-01 | PANEL,INDICATON |
| 214 | () | 2-375-731-01 | CONTROL PANEL |
| 301 | () | 3-437-110-01 | COVER,LAMP,RED |
| 302 | () | 3-437-110-11 | COVER,LAMP,GREEN |
| 303 | () | 3-437-110-31 | COVER,LAMP,ORANGE |
| 304 | | 3-646-090-00 | RIVET,NYLON |
| 305 | () | 3-657-153-00 | HINGE |
| 306 | | 3-668-028-00 | KNOB(SMALL),LEVER SWITCH |
| 307 | () | 3-673-694-00 | HOLDER,DME |
| 308 | | 3-701-513-00 | SCREW,SET,POINT,DOUBLE |
| 309 | | 3-880-553-00 | RUBBER,SW DIAL KNOB |
| 701 | | 7-621-981-15 | SCREW,PSW2.6x6 |
| 702 | | 7-682-247-09 | SCREW,+K3x6 |
| 703 | | 7-684-023-04 | NUT,M3 |
| 704 | | 7-685-133-14 | SCREW,+P2.6x6 |
| 705 | | 7-685-233-19 | SCREW,+KTP2.6x6 |
| 706 | | 7-686-453-01 | SCREW,PS3x20 |
| 707 | | 7-686-527-01 | SCREW,PSW3x6 |
| 708 | | 7-686-528-01 | SCREW,PSW3x8 |
| 709 | | 7-686-624-04 | SCREW,B3x6 |
| 710 | | 7-687-603-14 | SCREW,BTP2.6x6 |
| 711 | | 7-688-003-11 | WASHER,M3,MIDDLE |
| 801 | | 8-745-211-00 | DME DM211 |




**OVERALL ASSY**
**BKH-2501**

| Ref.No. or Q'ty | Part No. | Description |
|---|---|---|
| SW-27 BOARD (BKH-2501) | | |
| 1pc | () A-6017-098-A | COMPLETE PCB,SW-27 |
| (This assembly includes the following parts.) | | |
| C1,3,6 | 1-123-330-00 | CAP,ELECT 22 25V |
| C2,4,5,7,8 | 1-161-055-00 | CAP,CERAMIC 0.022 10% 50V |
| R32,35,42,43 | 1-214-119-00 | RES,METAL 300 1% 1/4W |
| R3,9,11 | 1-214-124-00 | RES,METAL 470 1% 1/4W |
| R1,2,4,5,6,7,8,10,12,13, 14,15,19,20,21,22,23, 24,25,26,27,28,29,30, 31,33,34,36,37,44,45, 46,47 | 1-214-125-00 | RES,METAL 510 1% 1/4W |
| RB1,2,3,4,5,6,7 | 1-231-410-00 | RES BLOCK,10Kx8 |
| R51,52 | 1-247-833-00 | RES,CARBON 1.2K 5% 1/6W |
| R16,17,18,38,39,40,41, 48,49,50 | 1-247-855-00 | RES,CARBON 10K 5% 1/6W |
| S40 | 1-464-194-00 | KEY BOARD UNIT,20-KEY |
| S2,3,4 | 1-516-995-00 | SWITCH,LEVER SLIDE |
| S1 | 1-552-059-00 | SWITCH,LEVER SLIDE |
| S15,16 | 1-552-412-00 | SWITCH,PUSH |
| S7,8,9,10,11,12,17,18, 19,32 | 1-554-041-11 | SWITCH,PUSH |
| S38 | 1-554-041-51 | SWITCH,PUSH |
| S36 | 1-554-041-61 | SWITCH,PUSH |
| S35 | 1-554-041-71 | SWITCH,PUSH |
| S5,6 | 1-554-042-11 | SWITCH,PUSH |
| S34 | 1-554-043-00 | SWITCH,PUSH |
| S39 | 1-554-043-21 | SWITCH,PUSH |
| S33 | 1-554-044-00 | SWITCH,PUSH |
| S37 | 1-554-044-21 | SWITCH,PUSH |

| Ref.No. or Q'ty | Part No. | Description |
|---|---|---|
| (SW-27 BOARD,BKH-2501) | | |
| S13,14,20,21,22,23,24, 25,26,27,28,30,31 | 1-554-048-00 | SWITCH,PUSH |
| S29 | 1-554-048-21 | SWITCH,PUSH |
| CN716 | 1-556-203-00 | WIRE,FLAT,11P |
| CN715 | 1-556-204-00 | WIRE,FLAT,12P |
| CN713,714 | 1-556-205-00 | WIRE,FLAT,25P |
| 4pcs | 3-646-090-00 | RIVET,NYLON |
| TP1,2 | () 3-673-805-01 | TERMINAL,TP |
| TPE1 | () 3-673-805-11 | TERMINAL,TP |
| 4pcs | 7-686-527-01 | SCREW,PSW3x6 |
| 4pcs | 7-686-624-04 | SCREW,B3x6 |
| D1,2,3,4,5,6,7,8,13,14, 15,16,17,18,19,20,21, 22,23,24,25,26,27,28, 29,30,31,32,33,34,36, 37,38,39,40,41,43,44, 45,46,47,48,49,50 | 8-719-815-55 | DIODE 1S1555 |
| D11 | 8-719-905-54 | LED,EBG5504S,GREEN |
| 2pcs | 4-866-397-00 | CUSHION,LED |
| D35,42 | 8-719-905-55 | LED,EAA5504S,ORANGE |
| 4pcs | 4-866-397-00 | CUSHION,LED |
| D9,10 | 8-719-905-56 | LED,EBR5504S,RED |
| 4pcs | 4-866-397-00 | CUSHION,LED |
| Q1,2 | 8-729-374-02 | TRANSISTOR 2SB740 |
| IC1,2,3,4,5,6,7 | 8-759-645-17 | IC M54517P |
| IC8,9,10,11,12,13,14 | 8-759-902-73 | IC SN74LS273N,TTL |



| Ref.No. or Q'ty | Part No. | Description |
|---|---|---|
| DP-37 BOARD (BKH-2501) | | |
| 1pc | () A-6017-099-A | COMPLETE PCB,DP-37 |
| (This assembly includes the following parts.) | | |
| C47 | 1-162-282-31 | CAP,CERAMIC 100PF 50V |
| C5 | 1-101-821-00 | CAP,CERAMIC 2200PF 500V |
| C37,45,46 | 1-108-555-00 | CAP,MYLAR 0.001 5% 50V |
| C1,3,35 | 1-108-579-00 | CAP,MYLAR 0.01 5% 50V |
| C21,34 | 1-108-603-00 | CAP,MYLAR 0.1 5% 50V |
| C38,39,43 | 1-109-549-00 | CAP,MICA 390PF 5% 100V |
| C31,36 | 1-109-554-00 | CAP,MICA 510PF 5% 100V |
| C6,7,10,11,14,15,18,19, 25,26,30,40 | 1-123-330-00 | CAP,ELECT 22 25V |
| C4 | 1-123-373-00 | CAP,ELECT 47 63V |
| C27,28,41 | 1-123-380-00 | CAP,ELECT 1 100V |
| C2,8,13,17,22,23,24,29, 32,33,42 | 1-161-055-00 | CAP,CERAMIC 0.022 50V |
| R1 | 1-212-372-00 | RES,METAL 10 5% 1W |
| R18,20 | 1-214-164-00 | RES,METAL 22K 1% 1/4W |
| RV1,2,5 | 1-224-938-00 | RES,VAR,METAL 2K |
| RV3,4 | 1-224-941-00 | RES,VAR,METAL 20K |
| RB11,20 | 1-231-385-00 | RES BLOCK,4.7Kx8 |
| RB4,12,19,21,22 | 1-231-410-00 | RES BLOCK,10Kx8 |
| RB1,2,3,5,6,7,8,9,10,14, 15,16,17,18 | 1-231-411-00 | RES BLOCK,100Kx8 |
| R4,5 | 1-247-807-00 | RES,CARBON 100 5% 1/6W |
| R10,13,15,16,17,34,38 | 1-247-831-00 | RES,CARBON 1 5% 1/6W |

| Ref.No. or Q'ty | Part No. | Description |
|---|---|---|
| (DP-37 BOARD,BKH-2501) | | |
| R12,24,27 | 1-247-842-00 | RES,CARBON 3K 5% 1/6W |
| R11 | 1-247-845-00 | RES,CARBON 3.9K 5% 1/6W |
| R19,21 | 1-247-847-00 | RES,CARBON 4.7K 5% 1/6W |
| R7 | 1-247-848-00 | RES,CARBON 5.1K 5% 1/6W |
| R6,29,30,31,32,33,35,41, 42 | 1-247-855-00 | RES,CARBON 10K 5% 1/6W |
| R2,3,8,25,28,36,39,40 | 1-247-862-00 | RES,CARBON 20K 5% 1/6W |
| R9 | 1-247-867-00 | RES,CARBON 33K 5% 1/6W |
| R37,48 | 1-247-879-00 | RES,CARBON 100K 5% 1/6W |
| R23,26 | 1-247-888-00 | RES,CARBON 240K 5% 1/6W |
| R14,22 | 1-247-903-00 | RES,CARBON 1M 5% 1/6W |
| L1,2,3 | 1-409-339-00 | COIL,SN |
| T1 | 1-433-248-00 | TRANSFORMER,OSC |
| FL1 | 1-519-251-00 | INDICATOR TUBE, FLUORESCENT,DC40026B2 |
| BZ1 | 1-529-010-00 | BUZZER |
| CN701M | 1-560-754-00 | RECEPTACLE,10P,MALE |
| CN702M | 1-560-757-00 | RECEPTACLE,26P,MALE |
| CN705M | () 1-560-759-00 | RECEPTACLE,10P,MALE |
| TP1,2,3,4,5,6,7,8,9,10, 11,12,13,14 | () 3-673-805-01 | TERMINAL,TP |
| TPE1,2 | () 3-673-805-11 | TERMINAL,TP |
| 2pcs | 7-621-911-30 | SCREW,B2x6 |
| 2pcs | 7-622-205-05 | NUT,M2 |
| 2pcs | 7-623-205-22 | WASHER,SPRING,M2 |
| 2pcs | 7-623-922-11 | WASHER,M2,NYLON |
| D1 | 8-719-191-07 | DIODE RD9.1E |
| D2,3,4 | 8-719-815-55 | DIODE 1S1555 |
| 6pcs | 4-866-397-00 | CUSHION,LED |
| Q1,2,3,5 | 8-729-177-43 | TRANSISTOR 2SD774 |
| Q4 | 8-729-612-77 | TRANSISTOR 2SA1027R |
| Q6,7 | 8-729-663-47 | TRANSISTOR 2SC1364 |
| IC40 | 8-759-132-40 | IC UPC324C |

| Ref.No. or Q'ty | Part No. | Description |
|---|---|---|
| (DP-37 BOARD,BKH-2501) | | |
| IC9, 13, 14, 21 | 8-759-915-75 | IC LH5101-45 |
| IC30,33 | 8-759-240-11 | IC TC4011BP,CMOS |
| IC32,46 | 8-759-240-13 | IC TC4013BP,CMOS |
| IC41 | 8-759-240-30 | IC TC4030BP,CMOS |
| IC22,35,36,42,45 | 8-759-240-69 | IC TC4069UBP,CMOS |
| IC31 | 8-759-240-71 | IC TC4071BP,CMOS |
| IC47 | 8-759-240-81 | IC TC4081BP,CMOS |
| IC43 | 8-759-241-75 | IC TC40175BP,CMOS |
| IC39 | 8-759-245-20 | IC TC4520BP,CMOS |
| IC28,37 | 8-759-900-32 | IC SN74LS32N,TTL |
| IC49 | 8-759-901-38 | IC SN74LS138N,TTL |
| IC38, 48 | 8-759-989-71 | IC SN74LS155AN |
| IC20,29 | 8-759-901-57 | IC SN74LS157N,TTL |
| IC34,44 | 8-759-902-44 | IC SN74LS244N,TTL |
| IC1,2,3,4,5,6,7,8,11,15, 16,17,18,19 | 8-759-904-71 | IC MSL917RS |
| IC23,24,25,26,27 | 8-759-995-10 | IC MSL9510RS |
| IC10,12 | 8-759-996-50 | IC MSL9650-01AS |

LE-16 BOARD (BKH-2501)

| | | | |
|---|---|---|---|
| 1pc | () | 1-606-691-00 | PC BOARD,LE-16, WITHOUT COMPONENTS |
| R1,2,3,4,5,6,7,8,9,10, 11,12,13,14,15,16,17 | | 1-247-811-00 | RES,CARBON 150 5% 1/6W |
| D9 | | 8-719-922-21 | LED,AR2222S,RED |
| D1,2,3,4,5,6,7,8,10,11, 12,13,14,15,16,17 | | 8-719-922-23 | LED,PG2222SX,GREEN |

| Ref.No. or Q'ty | | Part No. | Description |
|---|---|---|---|
| DE-08 BOARD (BKH-2501) | | | |
| 1pc | () | 1-606-692-00 | PC BOARD,DE-08, WITHOUT COMPONENTS |
| CN705F | () | 1-561-856-00 | PLUG,HOUSING,10P |
| | () | 1-560-763-00 | CONTACT,FEMALE |
| 1pc | () | 3-673-694-00 | HOLDER,DME |
| 2pcs | | 7-687-603-14 | SCREW,BTP2.6x6 |
| D1 | | 8-719-200-02 | DIODE 10E2 |
| DME1 | | 8-745-211-00 | DME DM211 |

FRAME (BKH-2501)

| | | |
|---|---|---|
| 1pc | 1-454-306-00 | CLUTCH,ELECTROMAGNETIC |

ACCESSORY SUPPLIED (BKH-2501)

| | | |
|---|---|---|
| 4pcs | 7-686-528-01 | SCREW,PSW 3x8 |

OPTIONAL FIXTURE (BKH-2501)

| | |
|---|---|
| 7-700-733-01 | ALIGNMENT SCREWDRIVER, SLOTTED HEAD |
| 7-700-736-03 | HEXAGONAL WRENCH, L-SHAPED,2mm DIA |
| 7-721-050-63 | SCREWDRIVER,TOTSU, 3mm DIA |
| J-6041-770-A | IC TEST CLIP,TC-16 |
| J-6041-780-A | IC TEST CLIP,TC-20 |

Manufacturer;
AP Products Incorporated
P.O.BOX 697 72 Corwin Drive
Painesville,Ohio 44077,USA
TEL:(216)-354-2101

# SECTION E
# CHANGED PARTS

| UP TO #12500 (BKH-2501) | #12501 & UP (BKH-2501) |
|---|---|

DP-37 BOARD (BKH-2501)

| | | | |
|---|---|---|---|
| C47 | NOT IN USE | 1-162-282-31 | CAP,CERAMIC 100PF 50V |
| R48 | NOT IN USE | 1-247-879-00 | RES,CARBON 100K 5% 1/6W |

BKH-2501
2-375-728-04

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Communication Products Group

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